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Credit Aggregates, Countercyclical Buffer: stylised facts*

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Abstract

The relationship between Credit to private sector, Growth and investment is in a first step evaluated empirically through Error Correction models (ECM), using Credit Level for various national economies. The more important results are the following: the quality of estimation results for the relationship between Investment (with a separate analysis for Business and Households) and Credit is much better than for the relationship between GDP and Credit and in most cases it's the Investment cycle that explains the Credit cycle. In addition, specific results for United States are given, replacing Credit Level data by Credit Flow data. In this case, both cycles drive each other for Business, whereas for Households, it's the investment cycle that drives the Credit cycle.

JEL-Classification: E32, E51
Keywords: Private Credit, Credit Cycle, Cointegration, Error Correction Model

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1 Basel III Private Credit Framework

1.1 Context

The Basel III countercyclical buffer is based on two macroeconomic variables, the deviation of the credit-to-GDP ratio with respect to its trend and the credit-to-GDP gap. The variables are described in details in Section IV of the Basel III document [BCBS, 2010a] and in the Guidance document [BCBS, 2010b]. The goal of the buffer is to lower the procyclicality of Private Credit.

1.2 Credit definition

In order to measure the private credit, the Basel Committee on Banking Supervision (BCBS) in its guidance guide document [BCBS, 2010b] recommends using a broad definition of credit that will encompass all sources of debt funds for the private sector, including funds raised abroad. This document underlines that *ideally the definition of credit should include all credit extended to households and other non-financial private entities in an economy independent of its form and the identity of the supplier of the funds.* The choice of a broad definition for the credit is aimed at limiting the incentive for banks to transfer some credit to the shadow banking system, as the total amount of credit and the associated regulatory constraints are then independent of which entities supply the funds to the private sector.

All securities held by banks and other financial institutions in trading and banking books should be part of the the credit aggregate, as well as securities held by other residents and non-residents. In order to avoid overlapping, the BCBS advises that credit flows between financial institutions should not be taken into account.

Public debt is also excluded from the aggregate as BCBS analysis showed its inclusion would dilute the cyclical properties.

1.3 Data

Several sources are available for private credit statistics: Central Banks' series, a World Bank database [1], IMF International Finance Statistics (IMF-IFS)[2] and a new database created by the Bank for International Settlements (BIS) that provides series with on average forty five years of quarterly data for forty advanced and emerging countries. This new database is described in a BIS paper [Dembiermont and al., 2013]. It's first reminded that these credit series need to be defined by the borrower, the lender and the financial instruments. The borrowers can be Non-Financial Corporations (NFC) [3], Households and

[1] http://data.worldbank.org/indicator/FS.AST.PRVT.GD.ZS, annual frequency

[2] These series start in 2001 for most countries)

[3] At least in the case the USA, it's easy to check using the flow of funds database (http://www.federalreserve.gov/releases/z1/) that the credit data for Non-Financial Corporations are in

Non-Profit Institutions Serving Households (NPISHs). These three sectors make up the "non-financial private sector". The database managers intend to take into account all sources of credit, whatever the country or category of the lender. It means especially that these data aim to encompass securitised credits held by the shadow banking sector or cross-border lending, in addition to credit by domestic commercial and saving banks or credit unions.

The paper described in details the series that have been selected, how they have been adjusted for breaks due to borrower, lender or instruments coverage changes. The series are available on a quarterly basis. In case they were initially compiled at an annual frequency quarterly data have been estimated using a Chow-Lin method for data completion. The National Financial Accounts [4] are the main data source, despite the fact that in most countries their new presentation [5] started only in the 1990s or later. The financial accounts encompass domestic and foreign loans to NFC, Households and NPISHs, as well as debt securities issued by non-financial corporations. The BIS database contains four series, for which the following notations are used : $\boldsymbol{Credit_t}$ = total credit to private sector, $\boldsymbol{Credit\_banks_t}$ = total credit to private sector by domestic banks, $\boldsymbol{Credit\_H_t}$ = total credit to households and NPISHs, $\boldsymbol{Credit\_NFC_t}$ = total to NFC.

For countries or periods for which financial accounts were not available, total credit to the private non-financial sector was estimated by using statistics about domestic bank credit (and possibly other domestic financial institutions) and statistics about cross-border bank credit provided by the BCBS as an approximation of total cross-border credit. In addition, during the subprime crisis many banks had to provide securitisation structures [6] with credit lines and guarantees [Acharya10 and al., 2010], this show how the ratio between domestic banks credit to private sector and total credit to private sector can be difficult to estimate.

The following other methodological issues are underlined:

- As the database aims at capture all lending sources, the credit volume due to loans within a private non-financial sector - especially the corporate sector - is included in the series and the data are not consolidated[7]. It has been decided that the series wouldn't be consolidated, because the credit's source (bank vs. corporate) doesn't affect the debt sustainability. However, consolidation may be relevant for loans between a parent company and its subsidiaries, as the only motivation for these loans is often tax optimisation. In practice, it has not been possible to remove those loans from the new credit series but trade credit are excluded from them.

fact the the sum of the credit data for Non-Financial Corporations (NFC) and Non-financial non-corporate business (NFNCB). The two sectors makes up the Non Financial Business, NFB. In the paper, the notation NFC is retained

[4]Available as claims to private sector in the IMF-IFS database for most countries.

[5]Currently under OECD System of National Account, 1993 (SNA93) except for Australia which follows SNA08

[6]Known as conduits, Special Purpose Vehicle (SPV) or Special Purpose Vehicle (SIV)

[7]Consolidation would imply netting out credits between entities of a given private sector

- Before the implementation of the International Financial Reporting Standards (IFRS)[8], derecognised securitised loans were off-bank's balance sheets and it may have an important impact on bank credit series. Acharya and al (2010) [Acharya10 and al., 2010], Khasawneh (2007) [Khasawneh, 2007] showed that during the subprime crisis many banks registered heavy losses triggered by liquidity or credit guarantees they were committed to provide as sponsor to some Securitisation structures [9]. However, if financial account (in their new presentation) are used to compile the total credit to non financial private sector, securitisation is not an issue credit from all sectors is taken into account, including all kind of conduits to which banks sell loans portfolios.

- If financial accounts are not available for a given country or period, the **cross-border component** of credit to private sector has to be estimated using the BIS International Banking Statistics (IBS). Several caveats need to be made regarding the IBS regarding cross-border lending. First, while these series take into account cross-border lending by foreign banks, they don't include loans provided by non-bank entities and in addition they are not always available on the same period than the domestic bank credit.

- Under IMF or UN rules, the nominal amounts plus accrued interest is used for loans'**valuation** while debt securities are supposed to be valued at market prices. In practice, debt securities are often reported at nominal values for various reasons which can alter international comparability.

- The series are reported in national currencies, thus currencies fluctuations can impact these statistics through cross-border credit and even domestic loans. Emerging economies have shown in the past that they are especially vulnerable to credit crisis associated to important exchange rates swings (Mexico, 1994, Argentina 2001, Thailand-Indonesia, Philippines and even Korea 1997-1998, Turkey (1994, 1999, 2001) Hungary (2009, 2012)).

1.4 Comparison between Bis New database and other sources

The *Credit-to-GDP* ratio at t is defined for a given country as:

$$\boldsymbol{Credit_t\text{-}to\text{-}GDP_t\text{-}ratio} = \frac{\boldsymbol{Credit_t}}{\boldsymbol{GDP_t}} \times \mathbf{100\%} \tag{1.1}$$

The McKinsey Global Institute (MGI) published three reports about the credit-fueled growth period that experienced many mature and emerging economies between the late nineties and 2007 [MGI, 2010] and the following ongoing deleveraging process [MGI, 2012],

[8]The International Accounting Standards Board's (IASB) mandate is to develop, and to promote the use of IFRS. Its equivalent for the United States is the Financial Accounting Standards Board (FASB).

[9]known as conduits, Special Purpose Vehicle (SPV) or Special Purpose Vehicle (SIV).

[MGI, 2015]. The *Credit-to-GDP-**ratio*** for year 2008 among several sources are displayed for selected countries and three aggregates in tables 1 to 3 and figure 1 shows the historical evolution. In Appendix A the same tables are available for year 2011 and several historical figures). Overall, results between MGI are very similar to BIS results.

Credit$_t$-to-GDP$_t$-ratio, 2008				
Country	BIS	IMF-IFS	World Bank	MGI
Australia	185%	N/A	122%	N/A
Canada	181%	N/A	125%	138%
China	116%	N/A	104%	108%
France	159%	N/A	109%	154%
Germany	118%	N/A	109%	128%
Italy	119%	102%	105%	121%
Japan	176%	N/A	176%	163%
South Korea	180%	149%	148%	195%
Spain	221%	195%	N/A	221%
Sweden	235%	N/A	128%	N/A
Switzerland	177%	N/A	158%	193%
United Kingdom	199%	207%	208%	215%
United States	168%	184%	188%	174%

Table 1: ***Credit$_t$-to-GDP$_t$-ratio***, 2008

$\boldsymbol{Credit\_H_t\text{-}to\text{-}GDP_t\text{-}ratio}$, 2008		
Country	BIS	MGI
Australia	103%	N/A
Canada	82%	84%
China	18%	12%
France	49%	44%
Germany	60%	62%
Italy	39%	40%
Japan	67%	67%
South Korea	75%	80%
Spain	82%	85%
Sweden	69%	N/A
Switzerland	103%	118%
United Kingdom	99%	101%
United States	95%	96%

Table 2: $\boldsymbol{Credit\_H_t\text{-}to\text{-}GDP_t\text{-}ratio}$, 2008

$\boldsymbol{Credit\_NFC_t\text{-}to\text{-}GDP_t\text{-}ratio}$, 2008		
Country	BIS	MGI
Australia	82%	N/A
Canada	98%	54%
China	98%	96%
France	110%	110%
Germany	58%	66%
Italy	79%	81%
Japan	109%	96%
South Korea	105%	115%
Spain	138%	136%
Sweden	165%	N/A
Switzerland	74%	75%
United Kingdom	100%	114%
United States	73%	78%

Table 3: $\boldsymbol{Credit\_NFC_t\text{-}to\text{-}GDP_t\text{-}ratio}$, 2008

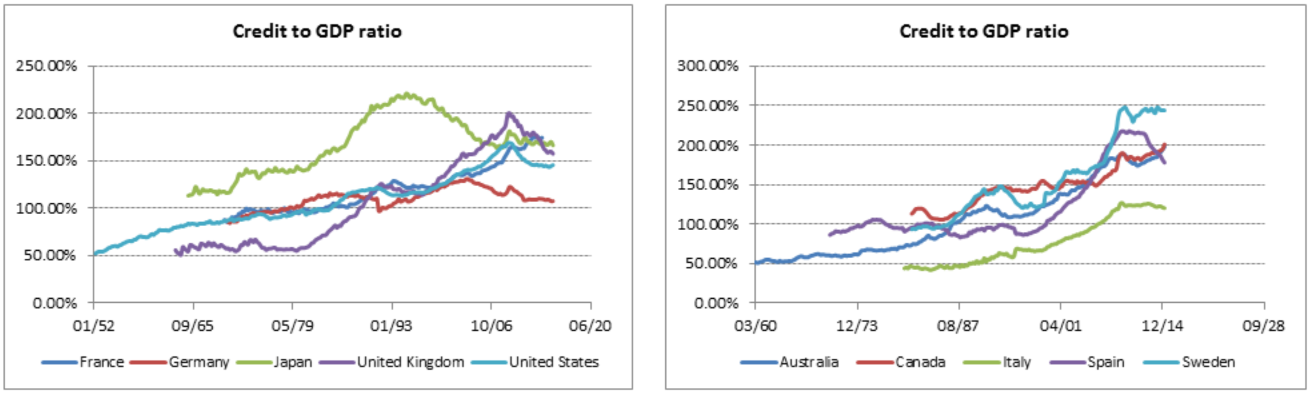


Figure 1: *Credit-to-GDP-**ratio***, Historical charts, selected countries

2 Credit and GDP/Investment Growth: Error Correction Model Analysis

2.1 Credit/GDP Error correction model

The purpose of this estimation is to determine if GDP is the most relevant flow variable to link to Credit when defining the countercyclical buffer, whatever may be its mathematical definition. It's very important to remind at this stage that Credit as previously defined is a stock variable.

Credit vs. GDP and GDP vs. Credit elasticities are measured by using Error Correction Model (ECM) in their simplest way:

$$
\begin{aligned}
&\boldsymbol{Credit_t = aGDP_t + b + \epsilon_t} \\
&\boldsymbol{\Delta Credit_t = \alpha \Delta GDP_t + \lambda \epsilon_{t-1} + \eta_t} \\
&\boldsymbol{GDP_t = a' Credit_t + b' + \epsilon'_t} \\
&\boldsymbol{\Delta GDP_t = \alpha' \Delta Credit_t + \lambda' \epsilon'_{t-1} + \eta'_t}
\end{aligned}
\tag{2.1}
$$

The following methodology is used: as ECM models are not estimated in order to find a formal alternative to the current definition of the countercyclical buffer or for forecast purpose, instead of trying to Estimate Vector Error Correction Model with lags and using step-wise methods, a simple ECM at annual frequency is estimated using end of the year data or quarterly data [10] . In addition elasticities are then measured through unique parameters, thus easier to interpret. All data are divided by GDP-deflator, *i.e* real, then logged. This enables to estimate the elasticities between Credit and GDP. The procedure is done for thirteen countries, using all data available.

2.2 Other data Sources, Seasonally Adjustment

The Bis data source for Credit Level in the case of USA is the Flow of funds database [11]. This database contains Level and Flow series, that can both be Seasonally Adjusted (SA) or not (NSA). The BIS data for Credit Level are the NSA Level data. The other economic series come from the data provider Macrobond. It has been tested in the case of USA that the following estimation results are very close when using SA series. As a consequence, it is chosen to use for all countries Bis series as they are, without making any seasonal adjustment. On the reverse, for GDP series, when SA series are not available in Macrobond [12], GDP series have been seasonally adjusted using the X-13ARIMA-SEATS seasonal adjustment method [13].

[10] The results presented in this first version of the paper are obtained from annual data. In addition, the Granger causality tests are provided both for the annual and quarterly estimation. The estimation and tests tables for annual data will be replaced by the ones for quarterly data in the next version of the paper

[11] http://www.federalreserve.gov/datadownload/Choose.aspx?rel=Z.1

[12] Sweden, Germany

[13] https://www.census.gov/ts/x13as/docX13AS.pdf

2.3 Statistical tests : individual series and cointegration tests

Before estimating the ECM models, several tests are done in four steps (Appendix B).

- **Step 1:** The Data Generation Process (DGP) of GDP and Credit series are analyzed through autocorrelations and partial autocorrelations (upon one time differentiated series) and Augmented Dickey-Fuller (ADF) tests upon series and upon one time differentiated series (Tables 17 to 20, pages 28 to 30). Credit and GDP series are found to be both I(1) in all countries. The number of lags, k in ADF tests is selected using in a first step Akaike criteria, with a maximum for k set at $= 3$. Then, the residuals of ADF tests are also tested through serial correlation and Ljung-Box Portmanteau (LB) test, which give very similar conclusion. If the *t-statistic* associated with the t^{th} lag is well below 2 and (LB) test show that the residuals of ADF tests are uncorrelated, then the final number of lags is set at *k-1*. In practice, the number of lags choosen by Akaike criteria is 1 for all countries, both for GDP and Credit, so that it has to be chosen between 1 and 0 through the LB test. The methodology is explained in pages 60 to 62 of [Pfaff, 2008].

- **Step 2:** A preliminary step before doing the ADF cointegration tests is to choose between the three possible DGP for the residuals of the basic regression of GDP vs. Credit and Credit vs. GDP: trend, drift, none (equations B.1a, B.1b, B.1c page 28). The none DGP is chosen in all cases according to the tests (Table 21, page 32) and it can be seen as a preliminary indicator on charts (examples 9, 10, 11, 12, pages 30 and 31) that these residuals do not exhibit significant trend or drift.

- **Step 3:** Then using Mac-kinnon tables, cointegration ADF tests between are done for all countries using the residuals whose DGP has been chosen in the previous step (Table 22, page 33).

- **Step 4:** Finally, for each ECM, a choice is made between a version with drift and and a version without drift, using Fischer test (Table 23, page 34).

The main results are the following: among the thirteen countries studied, it is possible to estimate both a Credit vs. GDP ECM and GDP vs Credit for only five countries (Australia, China, South Korea, Spain, United States, Tables 4 and 5). For Sweden and Canada it's only possible to estimate a Credit vs. GDP ECM. For Japan and Germany no estimation is possible for any sub-period. For Japan, as the real estate/equity bubble is generally seen as exploding in 1992, it was tried to estimate a model from 1966 to 1992 but results were not better. For Germany may be problem is the reunification in 1990. For Spain, even if data were available from 1970, the model was estimated on a shorter period [1983-2013]. That may be due to the fact that Spain became a democracy in 1976 and entered in European Union in 1986. For France, possible explanations may be that many "market-friendly" reforms occurred in France from 1976 to 1986, including the end of price and strong credit management by the government.

For all countries except China, data are available on a quarterly basis, so the estimation can also be done using Q1, Q2, Q3 data (results available on demand). Instead of using Q4 data for GDP, an alternative approach using all information available is to use the sum of Q1, Q2, Q3, Q4 real GDP, which is exactly the annual real GDP. The estimation was done for all countries and gave similar results (results are very similar for all countries and available on demand). Using quarterly data it is only possible to get ECM estimation for Australia, Canada, United States with similar elasticities for the three countries.

The Granger causality tests (Table 24 page 35) indicate that it's possible to say that GDP Granger-cause Credit for four Countries (Australia, Canada, Sweden, United States) using annual data, when using quarterly data it's only possible to say that for Canada and United States.

Overall for the five countries for which both the estimation of Credit vs. GDP and GDP vs. Credit ECM are possible, for most countries Credit vs. GDP elasticity is above 1, whereas the GDP vs. Credit Elasticity (which has no reason to be exactly the inverse of the previous one) is well below one and well below the previous elasticity. This results shouldn't be surprising regarding the growing Credit to GDP ratios that can be observed in all economies. Nevertheless, even for those countries both the significance of ECM parameters and so the model quality cannot be considered as especially good and in addition when using quarterly data the estimation is only possible for three countries. It is an incentive to find another variable that can be better explained by credit variations.

model		$credit_t = a + b GDP_t + \varepsilon_t$			$\Delta credit_t = \alpha \Delta GDP_t + \lambda \varepsilon_{t-1} + \nu_t$		
Country	**range**	**Estimate**	**t value**	**Pr(>|t|)**	**Estimate**	**t value**	**Pr(>|t|)**
Australia	1960-2014	a -3.70	-25.22	<2e-16 ***	α 1.40	10.99	2.8e-15 ***
		b 1.78	79.01	<2e-16 ***	λ -0.12	2.12	0.0386 *
Canada	1981-2014	a -4.02	-11.7	4.3e-13 ***	α **0.94**	**4.61**	**6.5e-05 *****
		b 1.62	33.4	< 2e-16 ***	λ -0.25	-2.54	0.0163 *
China	1986-2014	a -2.98	-16.78	8.32e-16 ***	β 0.02	6.61	1.42e-07 ***
		b 1.32	71.81	< 2e-16 ***	α **0.28**	**4.16**	**0.000203 *****
					λ -0.25	-5.58	2.99e-06 ***
South Korea	1970-2014	a -6.91	-26.74	<2e-16 ***	α **1.33**	**8.63**	**2.09e-11 *****
		b 1.53	75.60	<2e-16 ***	λ -0.19	-2.312	0.025 *
Spain	1984-2014	a -7.56	-9.98	6.87e-11 ***	α **1.23**	**4.76**	**5.29e-05 *****
		b 2.16	19.14	< 2e-16 ***	λ -0.20	-3.45	0.0018 **
Sweden	1981-2014	a -6.65	-11.31	1.03e-12 ***	α **0.86**	**2.90**	**0.00676 ****
		b 2.12	24.59	<2e-16 ***	λ -0.29	-3.28	0.00259 **
United States	1952-2014	a -4.16	-36.22	<2e-16 ***	β **0.021**	**3.90**	**0.000252 *****
		b 1.47	113.71	<2e-16 ***	α **0.84**	**5.88**	**2.05e-07 *****
					λ -0.18100	-3.34	0.001438 **

Table 4: $\boldsymbol{Credit_t = f(GDP_t)}$, ECM model

model		$GDP_t = a' + b'credit_t + \varepsilon_t$			$\Delta GDP_t = \alpha'\Delta credit_t + \lambda'\varepsilon_{t-1} + v_t$		
Country	range	Estimate	t value	Pr(>|t|)	Estimate	t value	Pr(>|t|)
Australia	1960 -2014	a' 2.12	37.95	<2e-16 ***	α' 0.50	11.05	2.31e-15 ***
		b' 0.56	79.01	<2e-16 ***	λ' -0.13	-2.15	0.0366 *
Canada	1981-2014	a' 2.61	19.46	<2e-16 ***	α' 0.44	4.70	5.03e-05 ***
		b' 0.60	33.40	<2e-16 ***	λ' -0.16	-1.42	0.17
China	1986-2014	a' 2.30	22.35	<2e-16 ***	α' **0.94**	**5.31**	**6.31e-06 *** **
		b' 0.76	71.81	<2e-16 ***	λ' -0.41	-2.99	0.00502 **
South Korea	1970-2014	a' 4.57	42.24	<2e-16 ***	α' **0.45**	**8.59**	**2.41e-11 *** **
		b' 0.65	75.60	<2e-16 ***	λ' -0.18	-2.46	0.0174 *
Spain	1984-2014	a' 3.73	23.98	<2e-16 ***	α' **0.40**	**5.56**	**6.03e-06 *** **
		b' 0.43	19.14	<2e-16 ***	λ' -0.15	-1.92	0.0657 .
Sweden	1981-2014	a' 3.08	22.54	<2e-16 ***	α' 0.25	3.01	0.0052 **
		b' 0.42	25.51	<2e-16 ***	λ' -0.087	-0.74	0.46419
United States	1952-2014	a' 2.85	53.87	<2e-16 ***	α' **0.58**	**13.61**	**<2e-16 *** **
		b' 0.68	113.71	<2e-16 ***	λ' -0.16	-2.61	0.0114 *

Table 5: $\boldsymbol{GDP_t = f(Credit_t)}$, ECM model

2.4 Credit/investment ECM

Using the same methodology than in the previous section, ECM models are now estimated to study the relationship between private credit and investment. The study is restricted to the six countries for which both the investments series and Credit series are available for at least thirty years (Australia, Canada, France, Japan, United Kingdom, United States).

- The first ECM links NFC's investment at $\boldsymbol{t}$ ($\boldsymbol{Invest\_NFC_t}$) and $\boldsymbol{Credit\_NFC_t}$. When not defined as itself, private NFC investment can be calculated as fixed private capital formation minus residential investment (e.g. USA).

- The second ECM links Investment from households and NPISHs' ($\boldsymbol{Invest\_H_t}$) and $\boldsymbol{Credit\_H_t}$ and non profit organizations Investments from households are calculated as investments in residential sector plus durable goods expenditure. The investments from NPISHs cannot be identified separately except for Canada, it is assumed anyway their amount is weak compared to households investments[14].

The aim of the study is to determine whether it's better to establish a link between Investment and credit or between GDP and Credit, nor to break down relationship between investment in a given quarter and Credit during for example the last four quarters.

The following results show that the link between investment and credit is easier to identify than the link between GDP and credit: parameters are quite significant for almost all ECM models, with only one exception for which the $\boldsymbol{t - statistic}$ coefficients linked to coefficient $\boldsymbol{\lambda}$ doesn't enable to validate an ECM model [15]. In this estimation, end of the year series are used for both investment and credit, using real data. The same ECM models has been estimated by replacing the Q4 series for investment by (Q1+Q2+Q3+Q4), as described in section 2.3. The results are quite similar and available on demand.

From the Granger causality tests results (Table 36 page 44 and Table 37 page 44), we can get the following results :

- For Corporates it's possible to say that Investment Granger-cause Credit in Australia, Canada, France, Japan, United Kingdom, United States. For Japan its not possible to have a conclusion.

- With respect to Households, its only possible to conclude that, for the periods studied, Investment Granger-cause Credit in Canada and United States and that Credit Granger-cause Investment in Australia, with no clear conclusion for other Countries.

[14] The series used for each country are displayed in Table 25 pages 36 at Appendix C which contains the same tests procedure than the one explained in subsection 2.3.

[15] Households investment as a function of $\boldsymbol{Credit\_H_t}$ for France. The explanation may be the strong governmental intervention through tax subsidies in France. On the reverse, the ECM model between $\boldsymbol{Credit\_H_t}$ and Households investment for France can be validated.

These results strongly advocate to study two alternatives the private Credit to GDP ratio : $\boldsymbol{Credit\_NFC}$ to private investment ratio and $\boldsymbol{credit\_H}$ to households investments ratio.

model		$Credit\_NFC_t = aInvest\_NFC_t + b + \varepsilon_t$			$\Delta Credit\_NFC_t = \beta + \alpha\Delta Invest\_NFC_t + \lambda\varepsilon_{t-1} + \nu_t$		
Country	**range**	**Estimate**	**t value**	**Pr(>|t|)**	**Estimate**	**t value**	**Pr(>|t|)**
		a 1.10	3.17	0.00314 **	β **0.046**	5.63	**2.58e-06 *** **
Australia	1977-2014	b 1.14	14.99	< 2e-16 ***	α **0.14**	2.21	**0.0338 ***
					λ -0.17	-4.55	6.44e-05 ***
		a 1.33	3.07	0.00442 **	β **0.027**	3.57	0.00126 **
Canada	1981-2014	b 1.13	12.88	5.52e-14 ***	α **0.25**	2.83	0.00844 **
					λ -0.12	-2.04	0.05093 .
		a 0.48	2.08	0.0446 *	β **0.023**	**6.61**	**1.42e-07 *** **
France	1977-2014	b 1.33	29.15	<2e-16 ***	α **0.28**	**4.16**	**0.000203 *** **
					λ -0.25	-5.58	2.99e-06 ***
		a -1.20	-2.20	0.0322 *	β **0.031**	**4.72**	**2.18e-05 *** **
Japan	1964-2014	b 1.29	25.72	<2e-16 ***	α **0.24**	**3.83**	**0.000381 *** **
					λ -0.16	-3.99	0.000230 ***
		a -5.94	-7.61	9.97e-10 ***			
United Kingdom	1966-2014	b 2.55	15.67	< 2e-16 ***	α 0.14	2.22	0.0314 *
					λ -0.10	-2.53	0.0150 *
					β **0.034**	**8.90**	**1.69e-12 *** **
United States	1952-2014	b 1.21	593.2	<2e-16 ***	α **0.27**	**5.28**	**1.93e-06 *** **
					λ -0.16	-5.18	2.82e-06 ***

Table 6: $\boldsymbol{Credit\_NFC_t = f(Invest\_NFC_t)}$, ECM model

model		$Invest\_NFC_t = a'Credit\_NFC_t + b' + \varepsilon_t$			$Invest\_NFC_t = \alpha'\Delta Credit\_NFC_t + \lambda'\varepsilon_{t-1} + \nu_t$		
Country	range	Estimate	t value	Pr(>|t|)	Estimate	t value	Pr(>|t|)
Australia	1977-2014	b' 0.72	164.5	<2e-16 ***	α' **0.81**	**3.21**	**0.00284 ****
					λ' **-0.25**	**-2.13**	**0.04027 ***
Canada	1981-2014	b' 0.72	260.6	<2e-16 ***	α' **0.77**	3.02	0.00514 **
					λ' -0.37	-2.87	0.00744 **
France	1977-2014	b' 0.70	582.9	<2e-16 ***	α' **0.9353**	**5.37**	**5.3e-06 *****
					λ' **-0.41**	**-3.10**	**0.00387 ****
Japan	1964-2014	a' 1.61	4.50	4.31e-05 ***	α' **0.84**	**4.26**	**9.4e-05 *****
		b' 0.72	25.72	< 2e-16 ***	λ' **-0.33**	**-3.09**	**0.00331 ****
United Kingdom	1966-2014	a' 2.73	20.51	<2e-16 ***	α' 0.32	2.37	0.02216 *
		b' 0.33	15.67	<2e-16 ***	λ' -0.28	-2.75	0.00857 **
United States	1952-2014	a' 0.25	2.25	0.0284 *	α' **0.92**	**7.19**	**1.17e-09 *****
		b' 0.80	58.24	<2e-16 ***	λ' -0.24	-2.89	0.00534 **

Table 7: $\boldsymbol{Invest\_NFC_t = f(Credit\_NFC_t)}$, ECM model

model		$Credit\_H_t = a Invest\_H_t + b + \varepsilon_t$			$\Delta Credit\_H_t = \beta + \alpha\Delta Invest\_H_t + \lambda\varepsilon_{t-1} + \nu_t$		
Country	range	Estimate	t value	Pr(>|t|)	Estimate	t value	Pr(>|t|)
Australia	1977-2014	a -5.52	-8.19	1.21e-09 ***	β **0.061**	13.47	5.80e-15 ***
		b 2.74	17.46	< 2e-16 ***	α **0.27**	4.36	0.000119 ***
					λ -0.08690	-4.80	3.32e-05 ***
Canada	1981-2014	a -1.81	-3.57	0.00115 **	β **0.032**	**4.72**	**2.18e-05 *****
		b 1.6595	16.58	< 2e-16 ***	α **0.24**	**3.83**	**0.000381 *****
					λ -0.16	-3.90	0.000230 ***
France	1980-2014	a -1.62	-2.68	0.0115 *			
		b 1.57	13.18	1.07e-14 ***	α 0.48	2.65	0.0125 *
					λ -0.11247	-2.393	0.0227 *
Japan	1980-2014				β 0.022	5.39	6.99e-06 ***
		b 1.14	895.2	<2e-16 ***	α 0.36	6.87	1.05e-07 ***
					λ -0.33	-6.86	1.09e-07 ***
United Kingdom	1980-2014	a -2.72	-4.73	4.03e-05 ***	β **0.045**	**9.09**	**2.95e-10 *****
		b 1.96	16.47	< 2e-16 ***	α **0.39**	**5.53**	**4.76e-06 *****
					λ -0.17	-6.74	1.53e-07 ***
United States	1952-2014	a -2.72	-8.00	4.35e-11 ***	β 0.042	11.89	< 2e-16 ***
		b 1.61	32.23	< 2e-16 ***	α **0.21**	**5.07**	**4.13e-06 *****
					λ -0.12	-7.65	2.16e-10 ***

Table 8: $\boldsymbol{Credit\_H_t = f(Invest\_H_t)}$, ECM model

model		$Invest\_H_t = a'Credit\_H_t + b' + \varepsilon'_t$			$Invest\_H_t = \beta' + \alpha'\Delta Credit\_H_t + \lambda'\varepsilon'_{t-1} + \nu'_t$		
Country	**range**	**Estimate**	**t value**	**Pr(>|t|)**	**Estimate**	**t value**	**Pr(>|t|)**
Australia	1977-2014	a' 2.32	19.57	<2e-16 ***	β' **-0.076**	**-3.47**	**0.00145 ****
		b' 0.32	17.15	<2e-16 ***	α' **1.49**	**4.87**	**2.56e-05 *****
					λ' -0.54	-4.51	7.35e-05 ***
Canada	1981-2014	a' 1.50	7.00	6.18e-08 ***			
		b' 0.54	16.58	< 2e-16 ***	α' 0.84	4.263	9.4e-05 ***
					λ' -0.34	-3.09	0.00331 **
France	1980-2014	a' 1.68	6.49	2.29e-07 ***			
		b' 0.54	13.18	1.07e-14 ***	α' 0.36	2.54	0.016 *
					λ' -0.114	-1.57	0.13
Japan	1980-2014	a' 1.56	3.70	0.000792 ***			
		b' 0.75	22.39	< 2e-16 ***	α' 1.00	5.40	6.22e-06 ***
					λ' -0.60	-3.80	0.000606 ***
United Kingdom	1980-2014	a' 1.75	9.44	6.72e-11 ***			
		b' 0.45	16.47	< 2e-16 ***	α' **0.62**	**4.37**	**0.000122 *****
					λ' -0.28	-2.52	0.017102 *
United States	1952-2014	a' 1.98	13.13	<2e-16 ***	β' **-0.035**	**-2.28**	**0.025996 ***
		b' 0.59	32.23	<2e-16 ***	α' **1.27**	**4.80**	**1.11e-05 *****
					λ' -0.29	-3.53	0.000812 ***

Table 9: $\boldsymbol{Invest\_H_t = f(Credit\_H_t)}$, ECM model

3 Cyclical correlations GDP Monetary Aggregates Credit USA

3.1 H.P. GDP/credit analysis

Cyclical correlations between GDP, Credit to private sector and various economic variables and Monetary Agregates (M0, M1, M2, M2-M1) are calculated for United States [16] using the methodology developped by Kydland and Prescott (1990) [Kydland and Prescott, 1990] :

- Let's $\boldsymbol{Y}$ be the GDP. A series $\boldsymbol{X}$ is said to be procyclical if $\boldsymbol{Corr(X_t, Y_t)}$ is positive and close to 1, countercyclical if $\boldsymbol{Corr(X_t, Y_t)}$ is negative and close to -1 and acyclical if $\boldsymbol{Corr(X_t, Y_t)}$ is small.
- Regarding the phase shift , if a series is procyclical but with $\boldsymbol{Corr(X_{t+h}, Y_t)}$ peaking at $\boldsymbol{h = i}$ with $\boldsymbol{i}$ negative, it is said that $\boldsymbol{X}$ leads $\boldsymbol{Y}$, if $\boldsymbol{i}$ positive, it is said that $\boldsymbol{X}$ laggs $\boldsymbol{Y}$. If $\boldsymbol{i} = 0$, it is said that $\boldsymbol{X}$ coincides with $\boldsymbol{Y}$.

All series have been divided by the deflator of the USA GDP and logged. The calculations have been done using both real and nominal series. The results are not very different using nominal series but generally leads to slightly lower correlations and for this reason the detailed results are reported here on real series. As the monetary policy changed in the mid 80's in USA, the analysis is done on three periods : 1959-2014, 1959-1986, 1986-2014 [17].

Several charts (2 page 18, 17 page 45, 19 page 46) show that on the three periods of analysis Credit to private sector is procyclical but laggs the Cycle. The "shift" with GDP is two quarters between 1959 and 1986 whereas it is four quarters between 1986 and 2014. The same conclusion can be inferred from other charts (3 page 18, 18 page 45, 20 page 46) between Credit to private sector and three variables that coincides with GDP : private consumption, private investment and importations.

The main difference between the two periods lies in the correlations between Monetary Aggregates and GDP or Credit to private sector.

Between 1959 and 1986, M0, M1, M2 and M2-M1 were procyclical and leading the cycle (2 or 3 quarters), with also a strong correlation with Credit to private sector and again a negative phase shift of two or three quarters. Between 1986 and 2014, there is no link between the last three monetary aggregates and GDP, whereas M0 is countercyclical . On the same period M2-M1 is positively correlated with credit to private sector but with a lag of 3 quarters, whereas we see negative correlations between Credit and M0 (negative shift

[16]The results of the same analysis for Euro Area will be provided in the next version of the paper. No interesting result was found for Japan and United Kingdom

[17]In addition to several charts, all correlations are displayed in Tables 38 to 43, pages 48 to 52.

of two quarters) and M1 (positive shift of three quarters) (charts 21 page 47 and again 3 page 18, 18 page 45, 20 page 46).

In summary: Credit lags GDP and Investment for both sub-period (1959-1986, 1986-2014) by three or four quarters. In the first sub-period monetary aggregates M0, M2-M1 and M2 lead GDP and Credit by three or four quarters, whereas in the second sub-period its only possible to say that M2-M1 lags the GDP by three quarters.

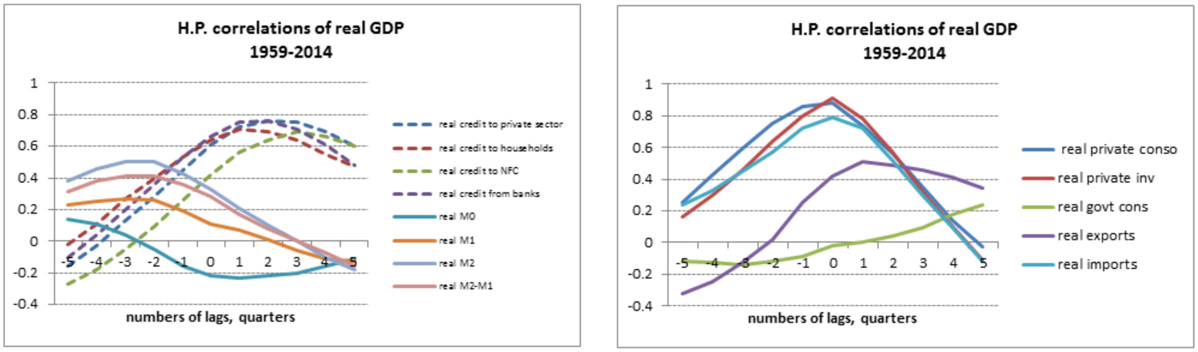


Figure 2: H.P. Correlations ***GDP***, USA, 1959-2014

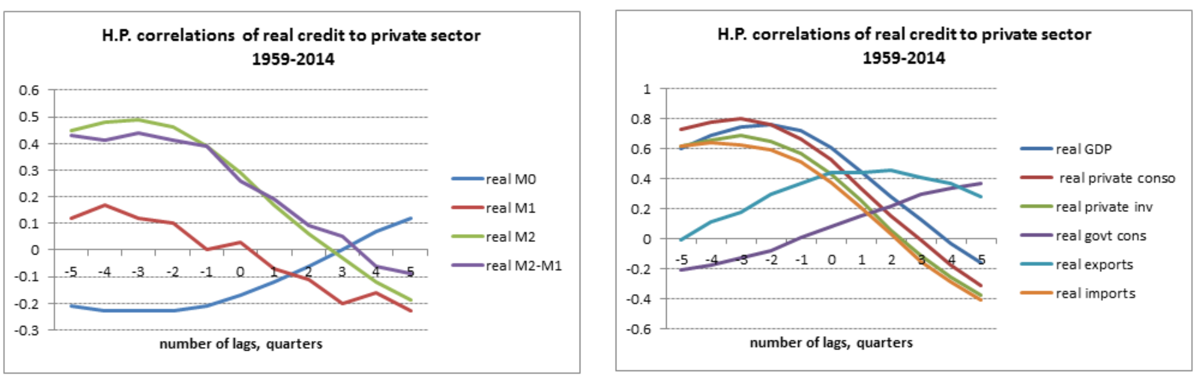


Figure 3: H.P. Correlations ***Credit***, USA, 1959-2014

3.2 H.P. Investment/credit analysis

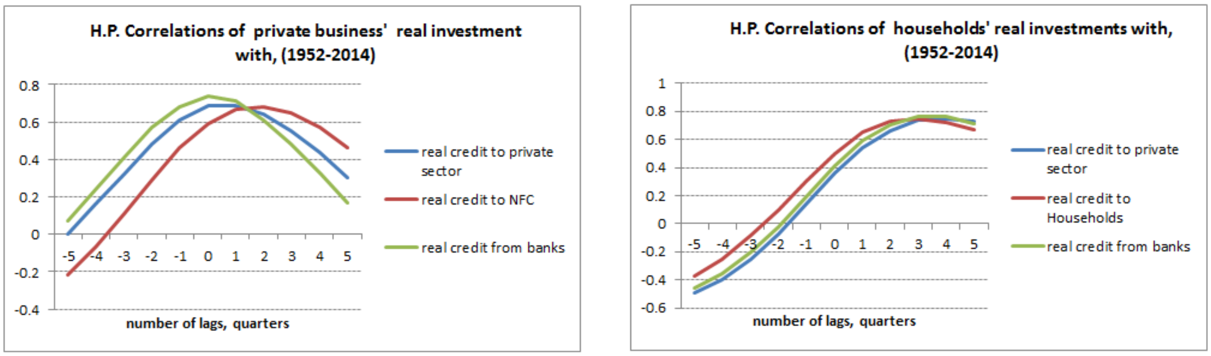


Figure 4: HP Correlations between Investment and private Credit, USA, 1959-2014

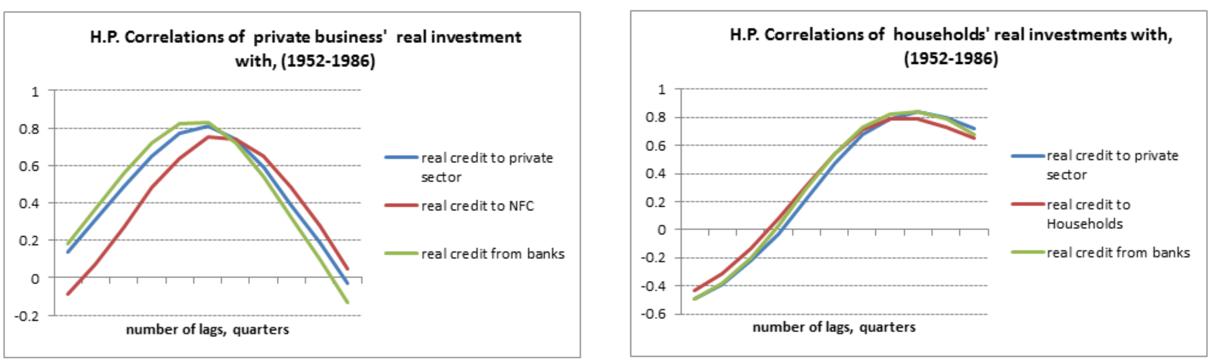


Figure 5: HP Correlations between Investment and private Credit, USA, 1959-1986

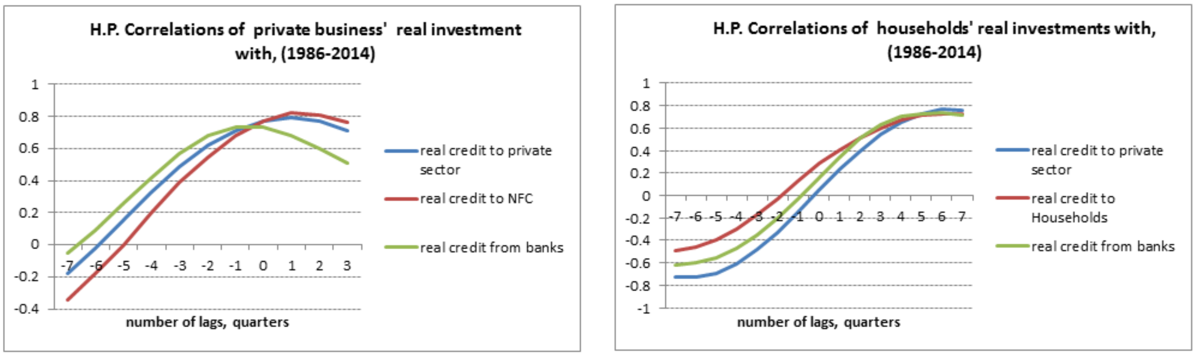


Figure 6: HP Correlations between Investment and private Credit, USA, 1986-2013

4 Credit Flow vs. Investment model Error correction model

4.1 Credit flow vs stock, USA data

All the previous studies has been done using credit stock series. In the flow of funds series[18], flow series are also available at quarterly and annual frequencies. After 1970, the flows data are not always equal to the first order difference of the stock series and sometimes the difference can be important. According to the federal reserve, the difference can be explained by interpolation and extrapolation methods. In addition as flow series are the sum of new credits, amortizing and early redemption of past credit, flow data can sometimes be negative. The following methodology is used. $\boldsymbol{X_t}$ being a series of real credit flows $\boldsymbol{(X)_t}$ that are sometimes negative, let's define

$$\boldsymbol{dLN(X_t)^{approx}} = \begin{cases} \frac{\boldsymbol{X_{t+1}-X_t}}{\boldsymbol{|X_t|}} & \boldsymbol{if\ \frac{|X_{t+1}-X_t|}{|X_t|} < 1} \\ \frac{\boldsymbol{X_{t+1}-X_t}}{\boldsymbol{max(|X_t|,|X_{t+1}|}}) & \text{else} \end{cases} \tag{4.1}$$

Then, starting the approximate series $\boldsymbol{LN(X_t)^{approx}}$ is built as:

$$\boldsymbol{LN(X_t)^{approx}} = \begin{cases} \boldsymbol{LN(X_1)^{approx} + \sum_{i=1}^{t-1} dLN(X_i)^{approx}} & \text{if} \quad \boldsymbol{t > 1} \\ \boldsymbol{LN(X_1)^{approx} = LN(X_1)} \end{cases} \tag{4.2}$$

There is obviously no guarantee to get a positive series this way, but in practice this approximation enables to get a positive a series on all countries (USA, Canada, Australia and even Japan and whatever the series frequency), conditional to the fact that $\boldsymbol{(X)_1 > 1}$. ECM results for USA are displayed in Tables 10 to 13 [19]. The fact that all parameters of the ECM models are very significant and so that the results are even better the ones from subsection 2.4 is a topic for further research.

For Corporates, Credit Granger-cause investment and also Investment Granger-cause Credit, whereas for Households it's only investment that Granger-cause Credit(Table 54 page 61).

[18]Financial Accounts of the United States http://www.federalreserve.gov/releases/z1/

[19]All tests with same procedure as in subsections 2.1 and 2.4 in Appendix E pages 53 to 59.

model		$Credit\_Flow\_NFC_t = aInvest\_NFC_t + b + \varepsilon_t$			$\Delta credit\_Flow\_NFC_t = \alpha \Delta Invest\_NFC_t + \lambda \varepsilon_{t-1} + \nu_t$		
frequency	**range**	**Estimate**	***t* value**	**Pr(>|t|)**	**Estimate**	***t* value**	**Pr(>|t|)**
Quarterly	1952-2014	*a* -14.52	-29.89	<2e-16 ***	α **5.05**	**4.74**	3.57e-06 ***
		b 3.57	49.65	<2e-16 ***	λ -0.18	**-5.09**	7.05e-07 ***
Annual	1952-2014	*a* -4.92	-9.535	1.11e-13 ***	α **1.75**	**2.59**	0.0122 *
		b 1.70	22.22	< 2e-16 ***	λ -0.68	**-4.95**	6.27e-06 ***
Quarterly	1952-Q2 2007	*a* -15.60	-32.82	<2e-16 ***	α **4.08**	**3.81**	0.00018 ***
		b 3.74744	52.37	<2e-16 ***	λ -0.20	**-4.93**	1.61e-06 ***

Table 10: ECM model Credit Flow NFC vs. INVEST NFC, United States

model		$Invest\_NFC_t = a'Credit\_Flow\_NFC_t + b' + \varepsilon'_t$			$Invest\_NFC_t = \beta' + \alpha' \Delta credit\_Flow\_NFC_t + \lambda' \varepsilon'_{t-1} + \nu'_t$		
Country	**range**	**Estimate**	***t* value**	**Pr(>|t|)**	**Estimate**	***t* value**	**Pr(>|t|)**
Quarterly	1952-2014	*a'* 4.31	85.91	<2e-16 ***	β' **0.01**	**5.89**	1.28e-08 ***
		b' 0.25	49.65	<2e-16 ***	α' **0.02**	**4.53**	9.41e-06 ***
					λ' -0.032	-4.45	1.32e-05 ***
Annual	1952-2014	*a'* 3.32	21.29	<2e-16 ***	β' **0.03**	**4.33**	5.92e-05 ***
		b' 0.53	22.22	<2e-16 ***	α' **0.04**	**2.21**	0.030970 *
					λ' -0.15	-3.81	0.000336 ***
Quarterly	1952-Q2 2007	*a'* 4.34	96.98	<2e-16 ***	β' **0.01**	**6.15**	3.77e-09 ***
		b' 0.25	52.37	<2e-16 ***	α' **0.01**	**3.44**	0.000703 ***
					λ' -0.03	-3.63	0.000348 ***

Table 11: ECM model INVEST NFC vs. Creditflow NFC, United States

model		$Credit\_Flow\_H_t = aInvest\_H_t + b + \varepsilon_t$			$\Delta credit\_Flow\_H_t = \alpha \Delta Invest\_H_t + \lambda \varepsilon_{t-1} + v_t$		
frequency	**range**	**Estimate**	**t value**	**Pr(>|t|)**	**Estimate**	**t value**	**Pr(>|t|)**
Quarterly	1952-2014	a -37.42	-45.77	<2e-16 ***	α **3.76**	**4.27**	2.74e-05 ***
		b 7.15	59.65	<2e-16 ***	λ -0.27	**-3.10**	0.00303 **
Annual	1952-2014	a -7.52	-12.60	<2e-16 ***	α **3.58**	**9.41**	2.37e-13 ***
		b 2.094	23.81	<2e-16 ***	λ -0.27	**-3.09**	0.00309 **
Quarterly	1952-Q2 2007	a -31.62	-55.18	<2e-16 ***	α **3.49**	**5.55**	8.25e-08 ***
		b 6.17	72.56	<2e-16 ***	λ -0.10	**-3.35**	0.000951 ***

Table 12: ECM model Credit Flow NFC vs. INVEST H, United States

model		$Invest\_H_t = a'Credit\_Flow\_H_t + b' + \varepsilon'_t$			$Invest\_H_t = \beta' + \alpha' \Delta credit\_Flow\_H_t + \lambda' \varepsilon'_{t-1} + v_t$		
frequency	**range**	**Estimate**	**t value**	**Pr(>|t|)**	**Estimate**	**t value**	**Pr(>|t|)**
Quarterly	1952-2014	a' 5.33	204.93	<2e-16 ***	β' **0.01**	**2.92**	0.00382 **
		b' 0.13	59.65	<2e-16 ***	α' **0.02**	**4.01**	8.14e-05 ***
					λ' -0.04	-2.66	0.00834 **
Annual	1952-2014	a' 3.90	31.79	<2e-16 ***	β' **0.02**	**2.35**	0.0224 *
		b' 0.43	23.81	<2e-16 ***	α' **0.16**	**9.34**	2.99e-13 ***
					λ' -0.01	-2.32	0.0239 *
Quarterly	1952-Q2 2007	a' 5.19	232.87	<2e-16 ***	β' **0.01**	**3.19**	0.00162 **
		b' 0.16	72.56	<2e-16 ***	α' **0.03**	**5.14**	6.09e-07 ***
					λ' -0.05	-2.50	0.01308 *

Table 13: ECM model INVEST NFC vs. ECM Creditflow H, United States

5 Conclusions

In the first two parts of this paper the link between Private Credit Stock and GDP or Investment is studied. Among thirteen important national economies [20], a long term significant relationship between Private Credit Stock and GDP can only be found for three countries: Australia, Canada and United States. For the two North America countries, its the GDP that explains the Private Stock Level so that more GDP means more Credit, whereas for Australia its on the reverse the Private Stock Level that explains the GDP. For the six national Economies [21] for which the same study is done between Investment

[20] Australia, Canada, China, France, Germany, Italy, Japan, South Korea, Spain, Sweden, Switzerland, United Kingdom, United States

[21] Australia, Canada, France, Japan, United Kingdom, United States

and Private Credit Stock, both for Corporates and Households, a long term very significant relationship can be found in all cases but one [22]. The Investment cycle drives the Credit Cycle for Corporates for five of these six countries, the exception being Japan for which its not possible to have a conclusion. With respect to Households, its only possible to conclude that for the periods studied, Investment cycle drives the Credit Cycle in Canada and United States, that Credit Cycle drives the Investment cycles in Australia, with no clear conclusion for other Countries. Then two results specific to the United States are found for two sub-periods, 1959-1986 and 1986-2014 : Credit lags GDP and Investment for both sub-period by three or four quarters. In the first sub-period monetary aggregates M0, M2-M1 and M2 lead GDP and Credit by three or four quarters, whereas in the second sub-period its only possible to say that M2-M1 lags the GDP by three quarters.

Finally, a very significant statistical relationship is found between Corporate Credit Flows (resp. Households) and Corporates Investment (resp. Households Investment). In this case, both cycles drive each other for Business, whereas for Households, it's the investment cycle that drives the Credit cycle. It remains an open question to see if the fact that some results that can be found for United States but not for most other countries can be explained but better statistical data or by fundamental economic dynamic difference.

[22] Credit and Investment of Households in France

A

Appendix 1, Credit ratios

Credit$_t$-to-GDP$_t$-ratio, 2011, Q2				
Country	BIS	IMF-IFS	World Bank	MGI
Australia	174%	N/A	123%	164%
Canada	183%	N/A	N/A	144%
China	152%	N/A	127%	108%
France	167%	116%	116%	159%
Germany	108%	106%	104%	109%
Italy	124%	102%	122%	127%
Japan	174%	N/A	175%	166%
South Korea	178%	N/A	138%	188%
Spain	216%	195%	209%	216%
Sweden	237%	N/A	136%	N/A
Switzerland	195%	N/A	170%	N/A
United Kingdom	179%	156%	184%	207%
United States	150%	148%	183%	157%

Table 14: ***Credit$_t$-to-GDP$_t$-ratio***, 2011, Q2

Credit_H$_t$-to-GDP$_t$-ratio, 2011, Q2		
Country	BIS	MGI
Australia	108%	105%
Canada	89%	91%
China	28%	N/A
France	54%	48%
Germany	57%	60%
Italy	43%	45%
Japan	67%	67%
South Korea	77%	81%
Spain	85%	82%
Sweden	76%	N/A
Switzerland	112%	N/A
United Kingdom	92%	98%
United States	84%	87%

Table 15: ***Credit_H$_t$-to-GDP$_t$-ratio***, 2011, Q2

$\boldsymbol{Credit\_NFC_t\text{-}to\text{-}GDP_t\text{-}ratio}$, 2011, Q2		
Country	BIS	MGI
Australia	66%	59%
Canada	94%	53%
China	124%	N/A
France	113%	111%
Germany	52%	49%
Italy	80%	82%
Japan	107%	99%
South Korea	101%	107%
Spain	133%	134%
Sweden	161%	N/A
Switzerland	83%	N/A
United Kingdom	87%	109%
United States	65%	72%

Table 16: $\boldsymbol{Credit\_NFC_t\text{-}to\text{-}GDP_t\text{-}ratio}$, 2011, Q2

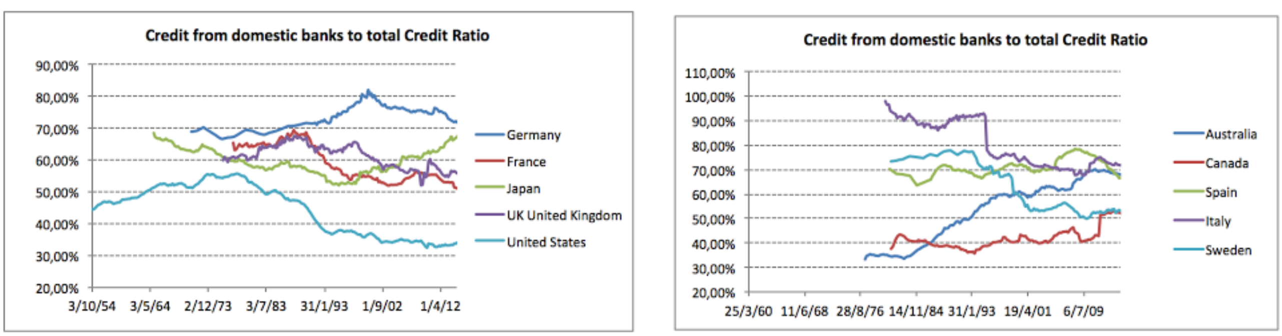
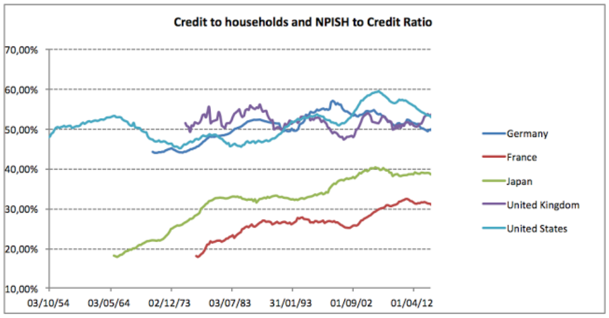


Figure 7: $\boldsymbol{Credit\_banks_t}$ $/\boldsymbol{Credit_t}$



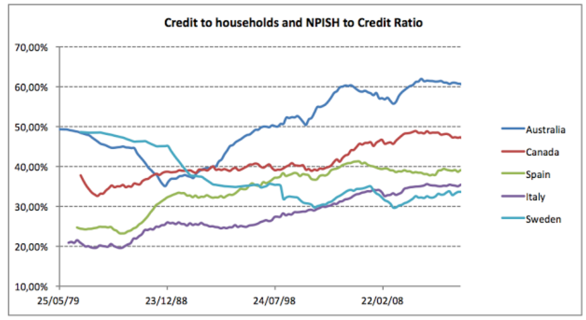


Figure 8: $\boldsymbol{Credit\_H_t} \ /\boldsymbol{Credit_t}$

B

Appendix 2, ADF tests credit and GDP

Dickey-Fuller Test three different combinations:

$$\Delta y_t = \beta_1 + \beta_2 t + \pi y_{t-1} + \sum_{j=1}^{k} \gamma_j \Delta y_{t-j} + u_{1t} \quad \text{(Trend process)} \tag{B.1a}$$

$$\Delta y_t = \beta_1 + \pi y_{t-1} + \sum_{j=1}^{k} \gamma_j \Delta y_{t-j} + u_{1t} \quad \text{(Drift process)} \tag{B.1b}$$

$$\Delta y_t = \pi y_{t-1} + \sum_{j=1}^{k} \gamma_j \Delta y_{t-j} + u_{1t} \quad \text{(None process)} \tag{B.1c}$$

B.1 Step 1, ADF tests on individual series, Credit and Investment

x = Credit$_t$, ADF tests

	auto correl (Δx)	ADF test	type	k	BJ test	Serial
Australia	0.45	-3.23 (-4.04-3.45)	trend	1	0.04	-0.27 (0.05)
Canada	0.32	-0.79 (-3.58 -2.93)	drift	1	0.46	-0.12 (0.49)
China	-0.09	0.24 (-3.58 -2.93)	drift	0	0.42	-0.14 (0.47)
France	0.41	-0.49 (-3.58 -2.93)	drift	1	0.66	0.07 (0.68)
Germany	0.6	1.73 (-2.62 -1.95)	none	1	0.66	-0.06 (0.66)
Italy	0.19	-0.95 (-3.58 -2.93)	drift	0	0.29	0.18 (0.31)
Japan	0.75	1.12 (-2.60 -1.95)	none	1	0.43	-0.11 (0.46)
South Korea	0.6	-3.49 (-4.15 -3.50)	trend	1	0.32	0.14 (0.33)
Spain	0.81	1.76 (-2.62 -1.95)	none	2	0.48	0.13 (0.50)
Sweden	0.61	1.83 (-2.62 -1.95)	none	1	0.58	-0.9 (0.62)
Switzerland	0.39	-0.66 (-3.58 -2.93)	drift	1	0.43	-0.13 (0.46)
United Kingdom	0.46	-0.73 (-3.51-2.89)	none	1	0.88	-0.02 (0.89)
United States	0.72	-2.13 (-3.51 -2.89)	drift	2	0.81	-0.03 (0.81)

Table 17: ADF tests on $\boldsymbol{Credit_t}$

ΔCredit$_t$, ADF tests

	ADF test	type	k	BJ test	Serial
Australia	-4.45(-3.51 -2.89)	drift	0	0.44	-0.10 (0.46)
Canada	-4.65 (-3.58 -2.93)	drift	0	0.61	-0.09 (0.64)
China	-5.50 (-3.58 -2.93)	drift	0	0.9	-0.02 (0.90)
France	-3.73(-3.58 -2.93)	drift	0	0.64	0.07 (0.67)
Germany	-2.25 (-3.58 -2.93)	none	0	0.23	-0.17 (0.23)
Italy	-4.58 (-3.58 -2.93)	drift	0	0.78	-0.05 (0.78)
Japan	-2.41 (-2.62 -1.95)	none	0	0.22	-0.17 (0.25)
South Korea	-4.59 (-3.58 -2.93)	drift	1	0.14	0.20 (0.14)
Spain	-1.97 (-2.62 -1.95)	none	1	0.55	0.11 (0.56)
Sweden	-2.66 (-2.62 -1.95)	none	0	0.6	0.09 (0.48)
Switzerland	-3.82 (-3.58 -2.93)	drift	0	0.53	-0.10 (0.56)
United Kingdom	-4.24 (-3.51 -2.89)	drift	0	0.87	-0.02 (0.88)
United States	-4.15 (-3.51 -2.89)	drift	1	0.87	-0.02 (0.87)

Table 18: ADF tests on $\boldsymbol{\Delta Credit_t}$

x = GDP$_t$, ADF tests

	auto correl (Δx)	ADF test	type	k	BJ test	Serial
Australia	0.04	-2.1 (-4.04 -3.45)	trend	0	0.86	-0.01 (0.86)
Canada	0.06	-0.57 (-3.58 -2.93)	drift	0	0.82	0.04 (0.80)
China	0.51	-4.33 (-4.15 -3.50)	trend	1	0.86	0.04 (0.85)
France	0.39	-1.44 (-3.58 -2.93)	drift	1	0.6	0.08 (0.63)
Germany	0.2	-2.07 (-3.58 -2.93)	drift	0	0.37	0.14 (0.42)
Italy	0.26	-2.9 (-3.58 -2.93)	drift	1	0.49	0.11 (0.52)
Japan	0.66	-2.72 (-4.15-3.50)	trend	0	0.14	0.20 (0.14)
South Korea	0.24	-0.29 (-4.15-3.50)	trend	0	0.7	-0.05 (0.71)
Spain	0.51	1.90 (-2.62 -1.95)	none	1	0.88	-0.02 (0.89)
Sweden	0.164	-0.5 (-3.58 -2.93)	drift	0	0.34	0.16 (0.38)
Switzerland	0.17	0.08 (-3.58 -2.93)	drift	0	0.31	0.17 (0.35)
United Kingdom	0.24	-0.74 (-3.51-2.89)	drift	1	0.7	0.05 (0.71)
United States	0.25	-1.84 (-3.51 -2.89)	drift	1	0.77	0.04 (0.78)

Table 19: ADF tests on $\boldsymbol{GDP_t}$

ΔGDP_t, ADF tests

	ADF test	type	*k*	BJ test	Serial
Australia	-6.92 (-3.51 -2.89)	drift	0	0.89	-0.02 (0.89)
Canada	-2.86 (-2.62 -1.95)	none	0	0.24	-0.20 (0.20)
China	-3.71 (-3.58 -2.93)	drift	1	0.9	0.02 (0.92)
France	-3.87 (-3.58 -2.93)	drift	0	0.69	0.06 (0.72)
Germany	-5.24(-3.58 -2.93)	drift	0	0.66	0.06 (0.67)
Italy	-4.18 (-3.58 -2.93)	drift	0	0.75	-0.05 (0.77)
Japan	-4.98 (-3.58 -2.93)	drift	0	0.64	0.06 (0.65)
South Korea	-4.73 (-3.58 -2.93)	drift	0	0.8	-0.03(0.81)
Spain	-2.1 (-2.62 -1.95)	none	0	0.23	-0.21 (0.28)
Sweden	-4.59 (-2.62 -1.95)	none	0	0	0.06 (0.74)
Switzerland	-4.69 (-3.58 -2.93)	drift	0	0.86	0.03 (0.84)
United Kingdom	-5.45 (-3.51 -2.89)	drift	0	0.7	0.05 (0.72)
United States	-6.02 (-3.51 -2.89)	drift	0	0.71	0.05 (0.72)

Table 20: ADF tests on $\boldsymbol{\Delta GDP_t}$

B.2 Step 2, DGP of residuals of linear regressions

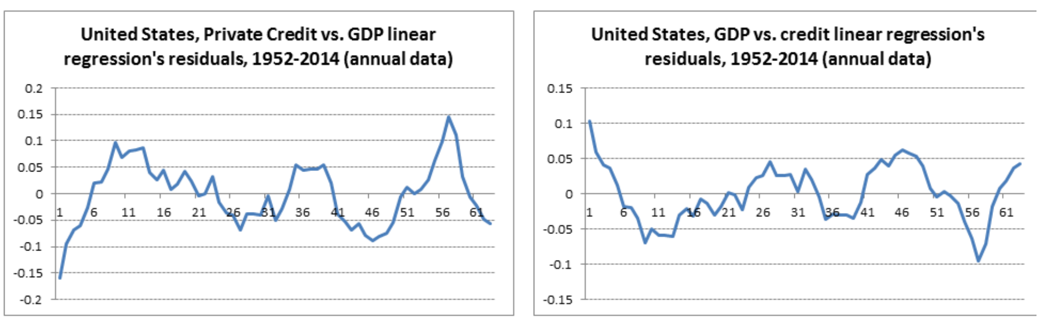


Figure 9: Residuals of linear regressions $\boldsymbol{Credit_t}$ vs. $\boldsymbol{GDP_t}$ and $\boldsymbol{GDP_t}$ vs. $\boldsymbol{Credit_t}$, USA, 1952-2014

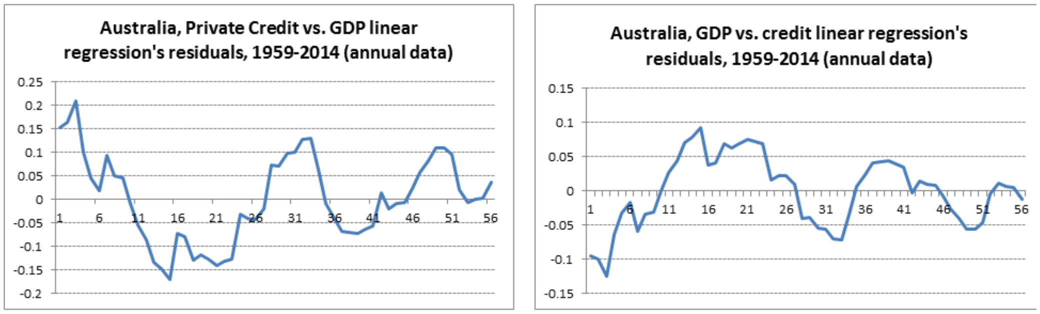


Figure 10: Residuals of linear regressions $\boldsymbol{Credit_t}$ vs. $\boldsymbol{GDP_t}$ and $\boldsymbol{GDP_t}$ vs. $\boldsymbol{Credit_t}$, Australia, 1960-2014

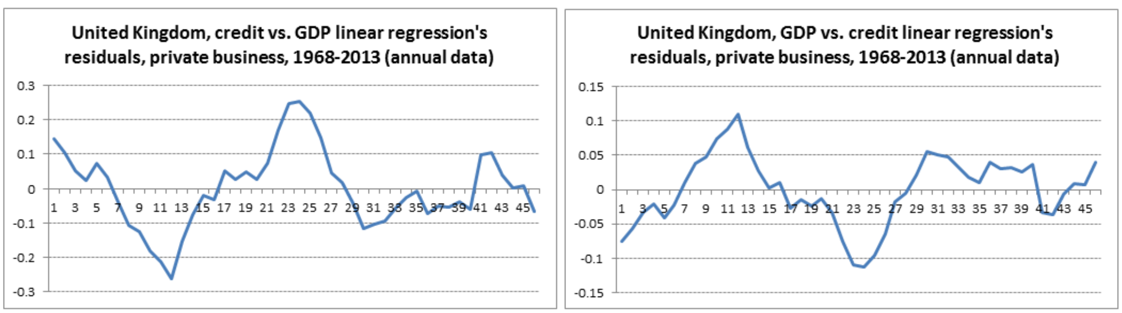


Figure 11: Residuals of linear regressions $\boldsymbol{Credit_t}$ vs. $\boldsymbol{GDP_t}$ and $\boldsymbol{GDP_t}$ vs. $\boldsymbol{Credit_t}$, United Kingdom, 1968-2014

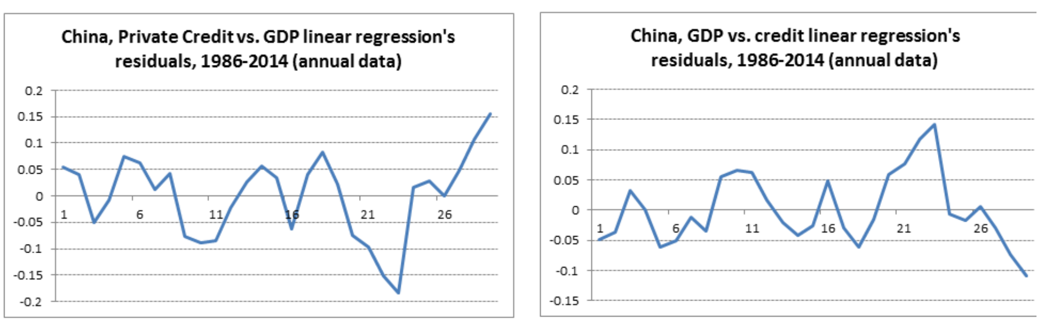


Figure 12: Residuals of linear regressions $\boldsymbol{Credit_t}$ vs. $\boldsymbol{GDP_t}$ and $\boldsymbol{GDP_t}$ vs. $\boldsymbol{Credit_t}$, China, 1986-2014

Setting the type of dynamic for ECM residuals ε_t and ε_t'						
	ECM, $credit_t = f(GDP_t)$					
	model tested for ε_t : trend				model tested for ε_t : drift	
	t-value trend	5% critical value	*t*-value drift	critical value	*t*-value drift	critical value
Australia	1.32	2.81	-1.37	3.14	-0.43	2.56
Canada	0.93	2.84	-0.91	3.18	-0.17	2.59
China	0.54	2.84	-0.51	3.19	-0.05	2.60
France	2.13	2.83	-1.77	3.17	0.17	2.58
Germany	-1.28	2.82	0.98	3.15	-0.31	2.57
Italy	3.10	2.83	-2.58	3.18	0.30	2.59
Japan	-0.17	2.81	-0.20	3.14	-0.73	2.56
South Korea	-2.06	2.81	2.26	3.14	0.92	2.56
Spain	1.04	2.84	-1.14	3.19	-0.46	2.60
Sweden	0.27	2.84	-0.24	3.18	0.02	2.59
Switzerland	-0.10	2.83	0.34	3.18	0.53	2.59
United Kingdom	0.02	2.81	-0.27	3.14	-0.54	2.56
United States	-0.93	2.80	0.92	3.13	0.21	2.55
	ECM, $f(GDP_t) = f(credit_t)$					
	model tested for ε_t' : trend				model tested for ε_t' : drift	
	t-value trend	5% critical value	*t*-value drift	critical value	*t*-value drift	critical value
Australia	-1.09	2.81	1.20	3.14	0.51	2.56
Canada	-0.50	2.84	0.57	3.18	0.29	2.59
China	-0.33	2.84	0.33	3.19	0.08	2.60
France	-1.95	2.83	1.70	3.17	-0.25	2.58
Germany	1.46	2.82	-1.08	3.15	0.44	2.57
Italy	-3.17	2.83	2.91	3.18	0.12	2.59
Japan	0.32	2.81	0.12	3.14	0.87	2.56
South Korea	2.45	2.81	-2.57	3.14	-0.83	2.56
Spain	-0.73	2.84	0.99	3.19	0.77	2.60
Sweden	0.00	2.84	-0.21	3.18	0.11	2.59
Switzerland	0.39	2.83	-0.50	3.18	-0.34	2.59
United Kingdom	0.31	2.81	0.02	3.14	0.62	2.56
United States	1.11	2.80	-1.06	3.13	-0.16	2.55

Table 21: Testing the type of process for ECM residuals

B.3 Step 3, ADF tests on linear regressions' residuals ϵ_t and $\epsilon_t^{'}$

Augmented Dickey–Fuller test (ADF) on credit/GDP ECM residuals, ε_t and ε_t'

	ADF test	ECM, $credit_t = f(GDP_t)$			
	type	*t* value	1% critical value	5% critical value	*k*
Australia	none	-2.57	-2.78	-1.95	1
Canada	none	-2.75	-2.92	-1.95	1
China	none	-2.81	-2.98	-1.95	1
France	none	-1.18	-2.88	-1.95	1
Germany	none	-1.45	-2.83	-1.95	1
Italy	trend	-1.56	-5.56	-4.04	0
Japan	none	-1.72	-2.80	-1.95	1
South Korea	none	-4.43	-2.80	-1.95	1
Spain	none	-1.98	-2.95	-1.95	1
Sweden	none	-2.77	-2.92	-1.95	1
Switzerland	none	-1.59	-2.91	-1.95	0
United Kingdom	none	-2.37	-2.80	-1.95	1
United States	none	-2.90	-2.76	-1.95	1

	ADF test	ECM, $GDP_t = f(credit_t)$			
	type	*t* value	1% p value	5% p value	*k*
Australia	none	-2.70	-2.78	-1.95	1
Canada	none	-2.88	-2.92	-1.95	1
China	none	-2.85	-2.98	-1.95	1
France	none	-1.46	-2.88	-1.95	1
Germany	none	-1.29	-2.83	-1.95	1
Italy	trend	-1.17	-5.56	-4.04	0
Japan	none	-1.85	-2.80	-1.95	1
South Korea	none	-4.16	-2.80	-1.95	1
Spain	none	-2.15	-2.95	-1.95	1
Sweden	none	-2.77	-2.92	-1.95	1
Switzerland	none	-1.57	-2.91	-1.95	0
United Kingdom	none	-2.37	-2.80	-1.95	1
United States	none	-2.82	-2.76	-1.95	1

Table 22: ADF tests on residuals ϵ_t and $\epsilon_t^{'}$, $\boldsymbol{Credit_t}$ and $\boldsymbol{GDPt}$

B.4 Step 4, Fischer tests

model 1 $\Delta credit_t = \beta + \alpha \Delta GDP_t + \lambda \varepsilon_{t-1} + v_t$

vs.

model 2 $\Delta credit_t = \alpha \Delta GDP_t + \lambda \varepsilon_{t-1} + v_t$

Probability associated to Fischer likelihood ratio test between model 1 and model 2

data used for investment	Q4	Q1+Q2+Q3+Q4
Australia	6.698e-05 ***	0.0001705 ***
China	0.008953 **	0.000108 ***
South Korea	1.272e-05 ***	0.0002936 ***
Spain	0.01229 *	0.1421
United Kingdom	0.06842 .	0.1598
United States	1.534e-05 ***	0.0003453 ***

model 1 $\Delta credit_t = \beta + \alpha \Delta GDP_t + \lambda \varepsilon_{t-1} + v_t$

vs.

model 2 $\Delta credit_t = \alpha \Delta GDP_t + \lambda \varepsilon_{t-1} + v_t$

Probability associated to Fischer likelihood ratio test between model 1 and model 2

data used for investment	Q4	Q1+Q2+Q3+Q4
Australia	0.0001161 ***	3.362e-08 ***
China	1.038e-09 ***	7.722e-09 ***
South Korea	7.986e-05 ***	4.004e-05 ***
Spain	0.002761 **	0.05861 .
United Kingdom	0.0003927 ***	0.0003804 ***
United States	0.04643 *	0.09329 .

Table 23: Fischer tests ECM 1 vs. ECM 2, variables $\boldsymbol{GDP_t}$ vs. $\boldsymbol{Credit_t}$

B.5 Step 5, Granger Causality tests

	Causality test: $\Delta GDP_t \rightarrow \Delta Credit_t$	H0: ΔGDP do not Granger-cause ΔCredit		Causality test: $\Delta Credit_t \rightarrow \Delta GDP_t$	H0: ΔCredit do not Granger-cause ΔGDP	
	number of lags, *k*	*p*_value, vcov.=NULL	p_value, vcov.=vcovHC(var_*k*)	number of lags, *k*	*p*_value, vcov.=NULL	*p*_value, vcov.=vcovHC(var_*k*)
Australia	1	0.07188	0.02544	1	0.9557	0.9527
Canada	1	0.05671	0.06359	1	0.03553	0.08489
China	8	0.1144	0.9575	8	0.02713	0.7705
South Korea	1	0.3455	0.4756	1	0.8916	0.9281
Spain	8	0.06036	0.5707	8	0.001492	0.1267
Sweden	1	0.002642	0.004847	1	0.449	0.6011
United States	2	0.0183	0.03603	2	0.6137	0.7032

data frequency : annual

	Causality test: $\Delta GDP_t \rightarrow \Delta Credit_t$	H0: ΔGDP do not Granger-cause ΔCredit		Causality test: $\Delta Credit_t \rightarrow \Delta GDP_t$	H0: ΔCredit do not Granger-cause ΔGDP	
	number of lags, *k*	*p*_value, vcov.=NULL	p_value, vcov.=vcovHC(var_*k*)	number of lags, *k*	*p*_value, vcov.=NULL	*p*_value, vcov.=vcovHC(var_*k*)
Australia	4	0.1616	0.1842	4	0.8522	0.8395
Canada	1	0.007043	0.003614	1	0.09867	0.3505
China						
South Korea						
Spain						
Sweden						
United States	8	3.20E-05	0.0001659	8	0.09912	0.2013

data frequency : quarterly

No ECM estimation possible for China, South Korea, Spain and Sweden

Table 24: Granger tests $\boldsymbol{GDP_t}$ vs. $\boldsymbol{Credit_t}$ and $\boldsymbol{Credit_t}$ vs. $\boldsymbol{GDP_t}$

C Appendix 3, ADF tests credit and investment

Invest_NFC definition by country : NFC Investment	
Australia	Gross Fixed Capital Formation, Private, Total Business Investment
Canada	Intellectual property products + Non-residential structures machinery and equipment : total Business gross fixed capital formation minus (Residential structures)
France	Gross Fixed Capital Formation, Non-Financial Corporations, Expenditure Approach
Japan	Gross Capital Formation, Gross Fixed Capital Formation, Private Non-Residential, Expenditure Approach
United Kingdom	Gross fixed capital formation by private sector - Gross Fixed Capital Formation, New Dwellings excl. Land, Private Sector
United States	Gross domestic product, Gross private domestic investment, Fixed investment, Nonresidential component
Invest_H definition by country : Households and NPISHs Investment	
Australia	Gross Fixed Capital Formation, Private, Dwellings, New, Current Prices + Final Consumption Expenditure, Households, Furnishings & Household Equipment + Purchase of Vehicles
Canada	Fixed Capital Formation, Residential structures + Durable goods expenditure (Household final consumption expenditure) + Non-profit institutions serving households' final consumption expenditure
France	Gross Fixed Capital Formation, Households, Expenditure Approach + Final Consumption Expenditure, Households, Capital Goods, Expenditure Approach
Japan	Gross Fixed Capital Formation, By Sector, Private Residential, Expenditure Approach + Expenditure Approach, Households, Consumption Expenditures, Durable Goods, Current Prices
United Kingdom	Gross Fixed Capital Formation, New Dwellings excl. Land, Private Sector + Final consumption expenditure of households, durable goods
United States	Gross domestic product, Gross private domestic investment, Fixed investment, residential component + Personal consumption expenditures, goods, Durable goods component
	Sources : Australian National Accounts, Statistics Canada, BEA, National Accounts (Macrobond)

Table 25: NFC, Households and NPISHs Investment definition

C.1 Step 1, ADF tests on individual series, Credit and Investment

x = $Credit\_NFC_t$, ADF tests

	auto correl (Δx)	ADF test	type	k	BJ test	Serial
Australia	0.61	1.76 (-2.62 -1.95)	none	1	0.81	0.02 (0.82)
Canada	0.11	-3.13 (-4.15 -3.50)	trend	1	0.62	-0.08 (0.64)
France	0.41	-3.94 (-4.15 -3.50)	trend	1	0.57	-0.09 (0.61)
Japan	0.77	0.92 (-2.6 -1.95)	none	1	0.64	-0.04 (0.66)
United Kingdom	0.19	-0.73 (-3.58 -2.93)	drift	0	0.18	0.18 (0.21)
United States	0.66	-2.19 (-3.51-2.89)	drift	2	0.83	-0.03 (0.84)

x = $Invest\_NFC_t$, ADF tests

	auto correl (Δx)	ADF test	type	k	BJ test	Serial
Australia	-0.02	1.9 (-2.62 -1.95)	none	0	0.9	-0.02 (0.91)
Canada	0.01	-3.90 (-4.15 -3.50)	trend	0	0.28	0.18 (0.32)
France	0.37	-4.1 (-4.15 -3.50)	trend	1	0.91	0.02 (0.91)
Japan	0.23	-2.63 (-3.51 -2.89)	drift	0	0.3	0.14 (0.27)
United Kingdom	0.14	1.43 (-2.62 -1.95)	none	0	0.31	0.14 (0.34)
United States	0.16	-1.60 (-3.51 -2.89)	drift	0	0.24	0.15 (0.26)

Table 26: ADF test on $\boldsymbol{Credit\_NFC_t}$

Δ*Credit_NFC$_t$*, ADF tests

	ADF test	type	*k*	BJ test	Serial
Australia	-2.02 (-2.62 -1.95)	none	0	0.6	-0.08 (0.64)
Canada	-5.02 (-3.58 -2.93)	drift	0	0.56	-0.10 (0.57)
France	-3.76 (-3.58 -2.93)	drift	0	0.68	0.07 (0.70)
Japan	-2.30 (-2.62 -1.95)	none	1	0.43	-0.11 (0.46)
United Kingdom	-4.53 (-2.62 -1.95)	none	0	0.19	-0.19 (0.21)
United States	-2.52 (-2.26 -1.95)	none	1	0.82	-0.0249

Δ*Invest_NFC$_t$*, ADF tests

	ADF test	type	*k*	BJ test	Serial
Australia	-5.79 (-2.62 -1.95)	none	0	0.84	-0.03 (0.85)
Canada	-6.12 (-3.58 -2.93)	drift	0	0.68	-0.07 (0.71)
France	-3.88 (-3.58-2.93)	drift	0	0.38	0.14 (0.41)
Japan	-5.19 (-2.62 -1.95)	none	0	0.42	0.11 (0.41)
United Kingdom	-5.65 (-2.62-1.95)	none	0	0.92	-0.013 (0.93)
United States	-5.45 (-2.62 -1.95)	none	0	0.47	-0.09 (0.49)

Table 27: ADF test on $\boldsymbol{\Delta Credit\_NFC_t}$

***x* = *Credit_H$_t$*, ADF tests**

	auto correl (Δx)	ADF test	type	*k*	BJ test	Serial
Australia	0.31	0.33 (-3.585 2.93)	drift	1	0.92	-0.021 (0.92)
Canada	0.43	-3.33 (-4.15 -3.50)	trend	1	0.55	-0.09 (0.58)
France	0.26	-1.24 (-3.58 -2.93)	drift	0	0.16	0.23 (0.17)
Japan	0.76	-3.16 (-3.58-2.93)	drift	1	0.67	-0.07 (0.69)
United Kingdom	0.76	1.04 (-2.62 -1.95)	none	1	0.19	-0.22 (0.21)
United States	0.70	1.98 (-2.6 -1.95)	none	1	0.39	0.11 (0.41)

***x* = *Invest_H$_t$*, ADF tests**

	auto correl (Δx)	ADF test	type	*k*	BJ test	Serial
Australia	-0.01	1.67 (-2.62 -1.95)	none	0	0.94	-0.01 (0.95)
Canada	0.01	-1.81 (-3.58 -2.93)	drift	0	0.55	0.10 (0.58)
France	0.42	-1.2 (-2.62 -1.95)	none	1	0.79	-0.04 (0.81)
Japan	-0.01	1.46 (-2.62 -1.95)	none	0	0.94	-0.01 (0.94)
United Kingdom	0.53	1.38 (-2.62 -1.95)	none	1	0.95	-0.01 (0.95)
United States	0.31	1.61 (-2.60 -1.95)	none	1	0.38	0.11 (0.40)

Table 28: ADF test on $\boldsymbol{Credit\_H_t}$

$x = \Delta Credit\_H_t$, ADF tests

	ADF test	type	k	BJ test	Serial
Australia	-4.24 (-3.58 -2.93)	drift	0	0.90	-0.01 (0.91)
Canada	-5.30 (-3.58 -2.93)	drift	0	0.15	0.24 (0.17)
France	-2.11 (-2.62-1.95)	none	0	0.03	-0.36 (0.03)
Japan	-1.91 (-2.62 -1.95)	none	0	0.25	-0.20 (0.29)
United Kingdom	-1.54 (-2.62 -1.95)	none	1	0.98	0.00 (0.99)
United States	-2.34 (-2.60 -1.95)	none	0	0.85	-0.02 (0.86)

$x = \Delta Invest\_H_t$, ADF tests

	ADF test	type	k	BJ test	Serial
Australia	-5.4 (-2.62 -1.95)	none	0	0.80	-0.04 (0.81)
Canada	-4.86 (-2.62-1.95)	none	0	0.77*	-0.05 (0.77)
France	-3.25 (-2.62 -1.95)	none	0	0.46	-0.12(0.50)
Japan	-5.12 (-2.62 -1.95)	none	0	0.65	-0.08 (0.66)
United Kingdom	-3.52 (-2.62 -1.95)	none	1	0.72	-0.06 (0.74)
United States	-5.20 (-2.60 -1.95)	none	0	0.58	0.07 (0.60)

Table 29: ADF test on $\boldsymbol{\Delta Credit\_H_t}$

C.2 Step 2, DGP of residuals of linear regressions

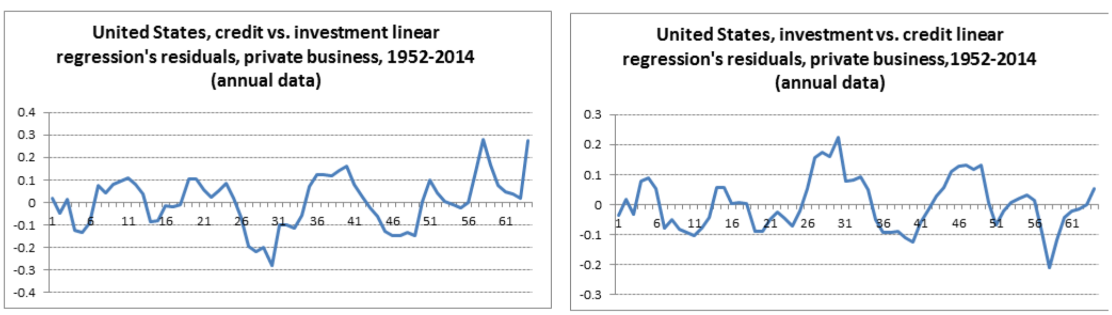


Figure 13: Residuals of linear regressions Credit vs. Investment and Investment vs. Credit, NFC, USA, 1952-2014

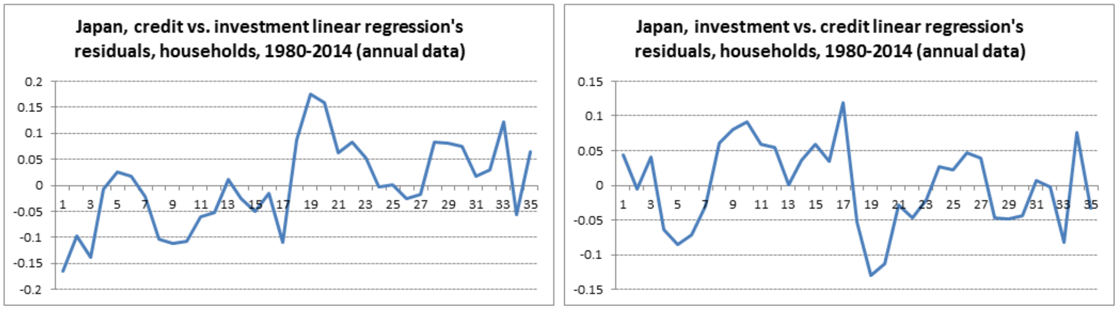


Figure 14: Residuals of linear regressions Credit vs. Investment and Investment vs. Credit, Households, Japan, 1980-2014

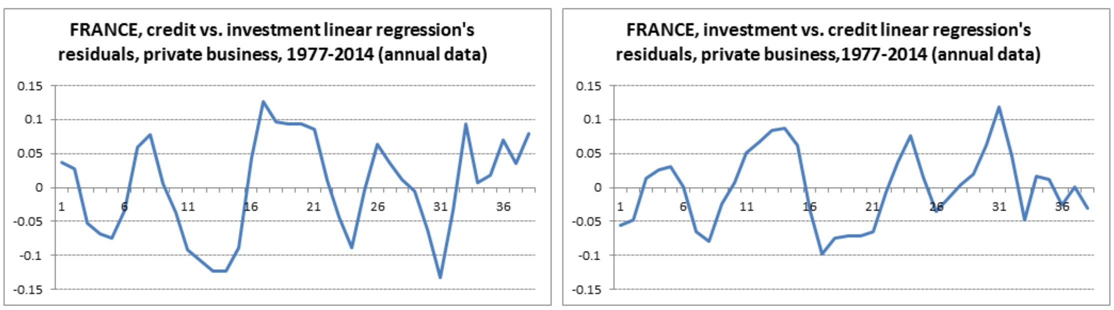


Figure 15: Residuals of linear regressions Credit vs. Investment and Investment vs. Credit, NFC, France, 1977-2014

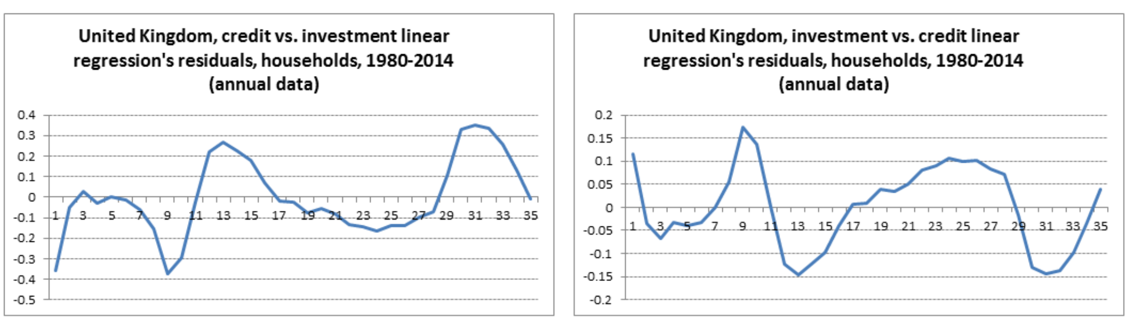


Figure 16: Residuals of linear regressions Credit vs. Investment and Investment vs. Credit, Households, United-Kingdom, 1980-2014

Setting the type of dynamic for ECM residuals ε_t and ε_t'

	ECM, *Credit_NFC*$_t$ = f(*Invest_NFC*$_t$)					
	model tested for ε_t : trend				model tested for ε_t : drift	
	t-value trend	5% critical value	*t*-value drift	5% critical value	*t*-value drift	5% critical value
Australia	0.29	2.83	-0.14	3.17	0.24	2.58
Canada	0.08	2.84	0.27	3.18	0.74	2.59
France	1.31	2.83	-1.17	3.17	-0.01	2.58
Japan	1.48	2.81	-1.53	3.14	-0.47	2.56
United Kingdom	1.82	2.82	-1.72	3.15	-0.18	2.57
United States	0.82	2.80	-0.66	3.13	0.13	2.55
	ECM *Invest_NFC*$_t$ = f(*Credit_NFC*$_t$)					
	model tested for ε_t' : trend				model tested for ε_t' : drift	
	t-value trend	5% critical value	*t*-value drift	5% critical value	*t*-value drift	5% critical value
Australia	0.57	2.83	-0.44	3.17	0.12	2.58
Canada	1.43	2.84	-1.46	3.18	-0.43	2.59
France	0.05	2.83	0.01	3.17	0.12	2.58
Japan	-0.63	2.81	0.86	3.14	0.64	2.56
United Kingdom	-0.43	2.82	0.56	3.15	0.38	2.57
United States	0.08	2.80	-0.09	3.13	-0.03	2.55

Table 30: Testing the type of process for ECM residuals

Setting the type of dynamic for ECM residuals ε_t and ε_t'

	ECM, *Credit_H*$_t$ = *f(invest_H*$_t$*)*					
	model tested for ε_t : trend				model tested for ε_t : drift	
	t-value trend	5% critical value	*t*-value drift	critical value	*t*-value drift	critical value
Australia	0.96	2.83	-0.76	3.17	0.17	2.58
Canada	0.95	2.84	-0.84	3.18	0.01	2.59
France	-0.26	2.83	0.77	3.18	1.49	2.59
Japan	1.67	2.84	-1.29	3.18	0.51	2.59
United Kingdom	1.58	2.83	-1.58	3.18	-0.34	2.59
United States	0.77	2.80	-0.61	3.13	0.14	2.55
	ECM, *f(invest_H*$_t$*)=f(credit_H*$_t$*)*					
	model tested for ε_t' : trend				model tested for ε_t' : drift	
	t-value trend	5% critical value	*t*-value drift	critical value	*t*-value drift	critical value
Australia	-0.17	2.83	0.17	3.17	0.03	2.58
Canada	0.80	2.84	0.96	3.18	0.54	2.59
France	1.23	2.83	-1.44	3.18	-0.74	2.59
Japan	-0.38	2.84	0.25	3.18	-0.18	2.59
United Kingdom	-0.48	2.83	0.68	3.18	0.55	2.59
United States	0.01	2.80	-0.02	3.13	-0.02	2.55

Table 31: Testing the type of process for ECM residuals

C.3 Step 3, ADF tests on linear regressions' residuals ϵ_t and $\epsilon_t^{'}$

Augmented Dickey–Fuller test (ADF) on NFC credit/investments ECM residuals, ε_t and ε_t'

	ADF test	ECM, *Credit_NFC$_t$ = f(Invest_NFC$_t$)*			
	type	*t* value	1% critical value	5% critical value	*k*
Australia	none	-2.09	-2.88	-1.95	0
Canada	none	-3.15	-2.92	-1.95	0
France	none	-3.80	-2.88	-1.95	1
Japan	none	-3.98	-2.80	-1.95	1
United Kingdom	none	-3.10	-2.83	-1.95	1
United States	none	-3.33	-2.76	-1.95	1

	ADF test	ECM *Invest_NFC$_t$ = f(Credit_NFC$_t$)*			
	type	*t* value	1% critical value	5% critical value	*k*
Australia	none	-2.18	-2.88	-1.95	0
Canada	none	-2.92	-2.92	-1.95	0
France	none	-4.13	-2.88	-1.95	1
Japan	none	-4.74	-2.80	-1.95	1
United Kingdom	none	-3.69	-2.83	-1.95	1
United States	none	-3.42	-2.76	-1.95	1

Table 32: ADF tests on residuals ϵ_t and $\epsilon_t^{'}$, $\boldsymbol{Credit\_NFC_t}$ and $\boldsymbol{Invest\_NFC_t}$

augmented Dickey–Fuller test (ADF) on households credit/ investments ECM residuals, ε_t and ε_t'

	ADF test	ECM, *Credit_H$_t$ = f(invest_H$_t$)*			
	type	*t* value	1% critical value	5% critical value	*k*
Australia	none	-2.30	-2.88	-1.95	0
Canada	none	-2.34	-2.92	-1.95	1
France	none	-2.80	-2.88	-1.95	1
Japan	none	-3.31	-2.92	-1.95	0
United Kingdom	none	-3.49	-2.91	-1.95	1
United States	none	-3.37	-2.76	-1.95	1

	ADF test	ECM, *f(invest_H$_t$)= f(credit_H$_t$)*			
	type	*t* value	1% critical value	5% critical value	*k*
Australia	none	-2.54	-2.88	-1.95	0
Canada	none	-2.80	-2.92	-1.95	1
France	none	-2.43	-2.88	-1.95	1
Japan	none	-3.60	-2.92	-1.95	0
United Kingdom	none	-4.04	-2.91	-1.95	1
United States	none	-3.49	-2.76	-1.95	1

Table 33: ADF tests on residuals ϵ_t and $\epsilon_t^{'}$, $\boldsymbol{Credit\_H_t}$ and $\boldsymbol{Invest\_H_t}$

C.4 ECM models and Fischer tests

model 1 $\Delta Credit\_NFC_t = \beta + \alpha \Delta Invest\_NFC_t + \lambda \varepsilon_{t-1} + v_t$

vs.

model 2 $\Delta Credit\_NFC_t = \alpha \Delta Invest\_NFC_t + \lambda \varepsilon_{t-1} + v_t$

Probability associated to Fischer likelihood ratio test between model 1 and model 2

data used for investment	Q4	Q1+Q2+Q3+Q4
Australia	7.842e-07 ***	2.616e-05 ***
Canada	0.0006361 ***	0.0008444 ***
France	3.251e-08 ***	5.684e-07 ***
Japan	1.076e-05 ***	0.0006264 ***
United Kingdom	0.0003825 ***	0.0001125 ***
United States	3.766e-13 ***	2.222e-13 ***

model 1 $Invest\_NFC_t = \beta' + \alpha' \Delta Credit\_NFC_t + \lambda' \varepsilon'_{t-1} + v'_t$

vs.

model 2 $Invest\_NFC_t = \alpha' \Delta Credit\_NFC_t + \lambda' \varepsilon'_{t-1} + v'_t$

Probability associated to Fischer likelihood ratio test between model 1 and model 2

data used for investment	Q4	Q1+Q2+Q3+Q4
Australia	0.8812	0.8113
Canada	0.4949	0.4134
France	0.1094	0.01959 *
Japan	0.8526	0.54
United Kingdom	0.6364	0.7641
United States	0.224	0.1064

Table 34: Fischer tests ECM 1 vs. ECM 2, variables $\boldsymbol{Invest\_NFC_t}$ and $\boldsymbol{Credit\_NFC_t}$

model 1 $\Delta Credit\_H_t = \beta + \alpha \Delta Invest\_H_t + \lambda \varepsilon_{t-1} + \nu_t$

vs.

model 2 $\Delta Credit\_H_t = \alpha \Delta Invest\_H_t + \lambda \varepsilon_{t-1} + \nu_t$

Probability associated to Fischer likelihood ratio test between model 1 and model 2

data used for investment	Q4	Q1+Q2+Q3+Q4
Australia	2.249e-16 ***	1.027e-14 ***
Canada	1.076e-05 ***	4.433e-11 ***
France	1.759e-09 ***	4.109e-11 ***
Japan	2.112e-06 ***	3.915e-05 ***
United Kingdom	2.997e-11 ***	2.997e-11 ***
United States	2.2e-16 ***	< 2.2e-16 ***

model 1 $Invest\_H_t = \beta' + \alpha' \Delta Credit\_NFC_t + \lambda' \varepsilon'_{t-1} + \nu'_t$

vs.

model 2 $Invest\_H_t = \alpha' \Delta Credit\_NFC_t + \lambda' \varepsilon'_{t-1} + \nu'_t$

	Q4	Q1+Q2+Q3+Q4
Australia	0.00082 ***	0.001241 **
Canada	0.8526	0.0009775 ***
France	0.8509	0.3801
Japan	0.2055	0.2494
United Kingdom	0.04037 *	0.04037 *
United States	0.02192	0.02192

Table 35: Fischer tests ECM 1 vs. ECM 2, variables $\boldsymbol{Invest\_H_t}$ and $\boldsymbol{Credit\_H_t}$

C.5 Granger tests

	Causality test: H0: $\Delta Invest\_NFC$ do not Granger-cause $\Delta Credit\_NFC$ $\Delta Invest\_NFC_t \rightarrow \Delta Credit_t$			Causality test: H0: $\Delta credit\_NFC$ do not Granger-cause $\Delta Invest\_NFC$ $\Delta Credit_t \rightarrow \Delta Invest\_NFC_t$		
	number of lags, *k*	*p*_value, vcov.=NULL	*p*_value, vcov.=vcovHC(var_*k*)	number of lags, *k*	*p*_value, vcov.=NULL	*p*_value, vcov.=vcovHC(var_*k*)
Australia	1	0.1155	0.206	1	0.2902	0.2307
Canada	1	0.05384	0.08994	1	0.01029	0.06286
France	3	0.0002358	0.0004523	3	0.04923	0.02749
Japan	2	0.03725	0.2285	2	0.1178	0.3107
United Kingdom	1	0.8437	0.8562	1	0.865	0.8787
United States	1	0.1264	0.2015	1	0.09055	0.04754

	Causality test: H0: $\Delta Invest\_H$ do not Granger-cause $\Delta Credit\_H$ $\Delta Invest\_H_t \rightarrow \Delta Credit_t$			Causality test: H0: $\Delta credit\_H$ do not Granger-cause $\Delta Invest\_H$ $\Delta Credit_t \rightarrow \Delta Invest\_H_t$		
	number of lags, *k*	*p*_value, vcov.=NULL	*p*_value, vcov.=vcovHC(var_*k*)	number of lags, *k*	*p*_value, vcov.=NULL	*p*_value, vcov.=vcovHC(var_*k*)
Australia	2	0.1533	0.1919	2	0.5411	0.5531
Canada	3	0.4028	0.8119	3	0.02998	0.05067
France	3	0.5711	0.5634	3	0.05058	0.03718
Japan	1	0.5246	0.5706	1	0.303	0.3882
United Kingdom	3	0.2294	0.6614	3	0.427	0.5614
United States	1	0.001124	3.30E-05	1	0.01521	0.06207

data frequency : annual

Table 36: Granger tests $\boldsymbol{Invest\_X_t}$ vs. $\boldsymbol{Credit\_X_t}$ and $\boldsymbol{Credit\_X_t}$ vs. $\boldsymbol{Invest\_X_t}$, $\boldsymbol{X = H}$ or $\boldsymbol{NFC}$, Annual Frequency

	Causality test: H0: $\Delta Invest\_NFC$ do not Granger-cause $\Delta Credit\_NFC$ $\Delta Invest\_NFC_t \rightarrow \Delta Credit_t$			Causality test: H0: $\Delta credit\_NFC$ do not Granger-cause $\Delta Invest\_NFC$ $\Delta Credit_t \rightarrow \Delta Invest\_NFC_t$		
	number of lags, *k*	*p*_value, vcov.=NULL	*p*_value, vcov.=vcovHC(var_*k*)	number of lags, *k*	*p*_value, vcov.=NULL	*p*_value, vcov.=vcovHC(var_*k*)
Australia	5	0.03799	0.05881	5	0.09763	0.1756
Canada	2	0.0004547	0.0002785	2	0.009766	0.1667
France	4	1.10E-06	1.41E-06	4	0.9252	0.9549
Japan	8	0.728	0.5357	8	0.4756	0.4765
United Kingdom	1	0.04674	0.03364	1	0.6906	0.6895
United States	5	0.01085	5.68E-03	5	0.07038	0.06812

	Causality test: H0: $\Delta Invest\_H$ do not Granger-cause $\Delta Credit\_H$ $\Delta Invest\_H_t \rightarrow \Delta Credit_t$			Causality test: H0: $\Delta credit\_H$ do not Granger-cause $\Delta Invest\_H$ $\Delta Credit_t \rightarrow \Delta Invest\_H_t$		
	number of lags, *k*	*p*_value, vcov.=NULL	*p*_value, vcov.=vcovHC(var_*k*)	number of lags, *k*	*p*_value, vcov.=NULL	*p*_value, vcov.=vcovHC(var_*k*)
Australia	6	0.2736	0.5217	6	0.003617	0.0003146
Canada	4	0.0008032	0.000391	4	0.6249	0.7802
France	3	0.293	0.2651	3	0.377	0.3509
Japan	4	0.5571	0.722	4	0.04279	0.08052
United Kingdom						
United States	3	1.56E-04	4.37E-07	3	0.08307	0.09419

data frequency : quarterly

Table 37: Granger tests $\boldsymbol{Invest\_X_t}$ vs. $\boldsymbol{Credit\_X_t}$ and $\boldsymbol{Credit\_X_t}$ vs. $\boldsymbol{Invest\_X_t}$, $\boldsymbol{X = H}$ or $\boldsymbol{NFC}$, Quarterly Frequency

D

Appendix 4 HP Correlations figures

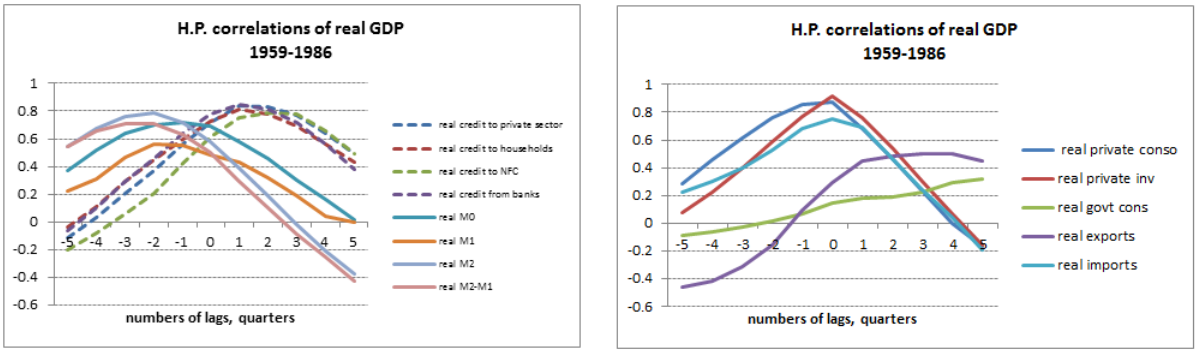


Figure 17: H.P. Correlations $\boldsymbol{GDP}$, USA, 1959-1986

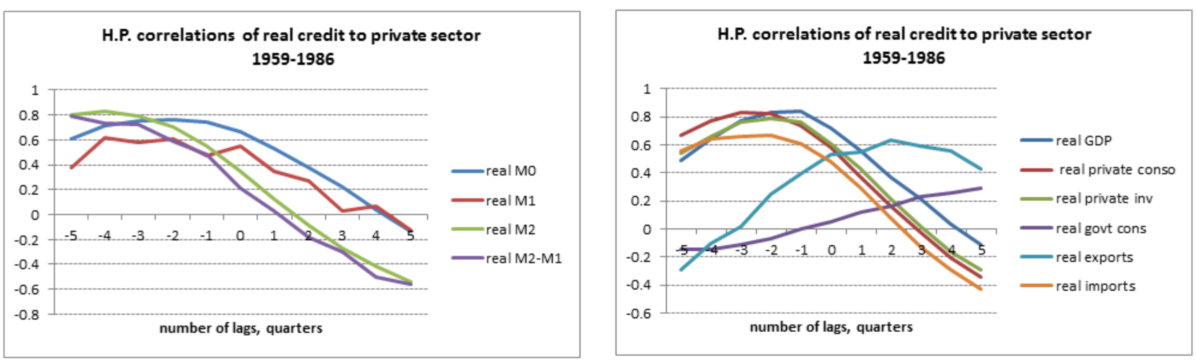


Figure 18: H.P. Correlations $\boldsymbol{Credit}$, USA, 1959-1986

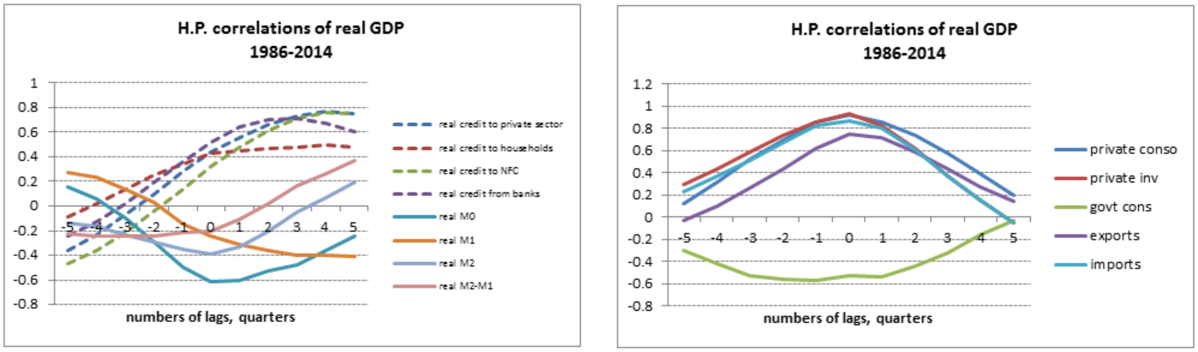


Figure 19: H.P. Correlations $\boldsymbol{GDP}$, USA, 1986-2014

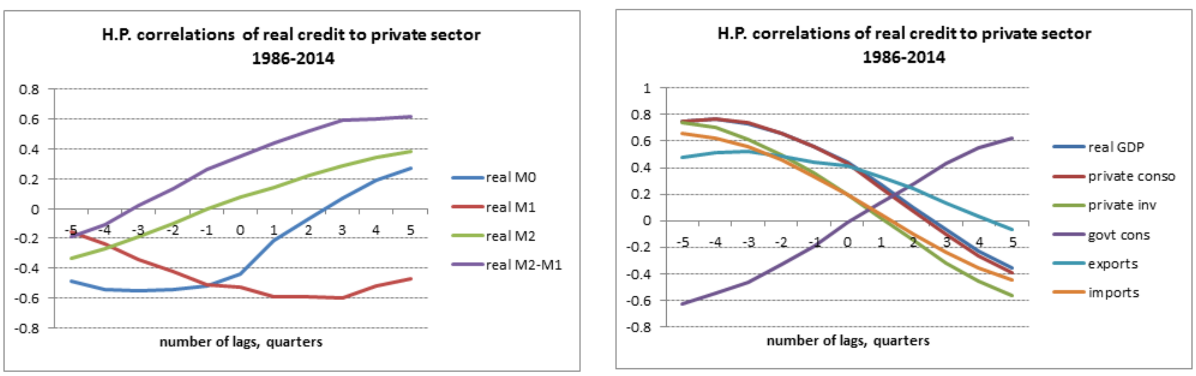
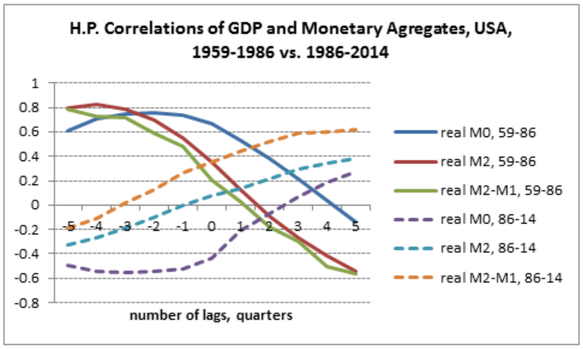


Figure 20: H.P. Correlations $\boldsymbol{Credit}$, USA, 1986-2014



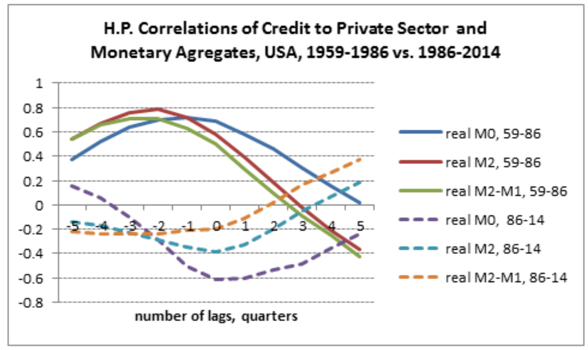


Figure 21: H.P. Comparison of H.P. Correlations with Monetary Aggregates for ***GDP*** et Credit to private sector, USA, 1959-1986 vs. 1986-2014

Cross Correlation of real credit from banks with

	x_{t-5}	x_{t-4}	x_{t-3}	x_{t-2}	x_{t-1}	x_t	x_{t+1}	x_{t+2}	x_{t+3}	x_{t+4}	x_{t+5}
real M0	-0.07	-0.13	-0.17	-0.19	-0.2	-0.17	-0.14	-0.09	-0.02	0.04	0.06
real M1	0.26	0.28	0.18	0.11	0	-0.01	-0.13	-0.19	-0.28	-0.25	-0.35
real M2	0.45	**0.48**	**0.49**	**0.46**	0.39	0.29	0.17	0.06	-0.03	-0.12	-0.19
real M2-M1	0.43	0.41	0.44	0.41	0.39	0.26	0.19	0.09	0.05	-0.06	-0.09
real private conso	0.64	**0.73**	**0.77**	**0.76**	0.69	0.57	0.4	0.22	0.05	-0.12	-0.25
real private inv	0.52	0.61	**0.67**	**0.68**	**0.64**	0.52	0.35	0.15	-0.04	-0.2	-0.32
real govt cons	-0.24	-0.23	-0.2	-0.15	-0.08	-0.02	0.07	0.15	0.25	0.31	0.37
real exports	-0.11	0.04	0.16	0.32	0.41	**0.48**	**0.48**	**0.49**	0.44	0.38	0.3
real imports	0.51	**0.57**	**0.6**	**0.61**	0.55	0.44	0.28	0.09	-0.09	-0.24	-0.35

Cross Correlation of real credit to Households with

	x_{t-5}	x_{t-4}	x_{t-3}	x_{t-2}	x_{t-1}	x_t	x_{t+1}	x_{t+2}	x_{t+3}	x_{t+4}	x_{t+5}
real M0	-0.08	-0.07	-0.08	-0.1	-0.12	-0.11	-0.11	-0.1	-0.08	-0.05	-0.02
real M1	0.2	0.33	0.26	0.23	0.15	0.23	0.09	0.02	-0.09	-0.02	-0.15
real M2	0.48	**0.53**	**0.54**	**0.51**	0.44	0.32	0.17	0.03	-0.09	-0.2	-0.3
real M2-M1	0.42	0.39	0.44	0.42	0.38	0.2	0.12	0.01	-0.06	-0.22	-0.25
real private conso	0.59	0.65	**0.71**	**0.7**	**0.66**	0.56	0.41	0.24	0.1	-0.07	-0.31
real private inv	0.5	0.54	**0.58**	**0.6**	**0.58**	0.49	0.38	0.23	0.08	-0.08	-0.2
real govt cons	-0.1	-0.07	-0.05	-0.02	0.04	0.06	0.09	0.12	0.18	0.2	0.21
real exports	-0.18	-0.07	0	0.17	0.28	0.4	0.44	**0.52**	**0.5**	**0.49**	0.41
real imports	0.51	**0.54**	**0.53**	**0.52**	0.49	0.41	0.29	0.15	-0.01	-0.15	-0.28

Cross Correlation of real credit to NFC with

	x_{t-5}	x_{t-4}	x_{t-3}	x_{t-2}	x_{t-1}	x_t	x_{t+1}	x_{t+2}	x_{t+3}	x_{t+4}	x_{t+5}
real M0	-0.31	-0.34	-0.34	-0.3	-0.25	-0.17	-0.08	0.02	0.11	0.2	0.26
real M1	-0.02	-0.05	-0.08	-0.07	-0.15	-0.17	-0.2	-0.19	-0.25	-0.24	-0.23
real M2	0.31	0.33	0.33	0.31	0.27	0.22	0.16	0.1	0.05	0	-0.03
real M2-M1	0.33	0.35	0.36	0.32	0.33	0.28	0.23	0.17	0.15	0.11	0.08
real private conso	**0.69**	**0.73**	**0.71**	0.64	0.53	0.37	0.2	0.01	-0.14	-0.27	-0.36
real private inv	**0.6**	**0.62**	**0.61**	0.54	0.42	0.25	0.06	-0.13	-0.28	-0.4	-0.48
real govt cons	-0.26	-0.23	-0.16	-0.09	0	0.1	0.2	0.29	0.37	0.42	0.45
real exports	0.16	0.25	0.31	0.36	0.36	0.37	0.32	0.28	0.2	0.15	0.07
real imports	**0.58**	**0.6**	**0.58**	0.52	0.4	0.25	0.07	-0.1	-0.26	-0.37	-0.44

Table 38: HP Correlations "GDP" Monetary Aggregates Credit, USA, 1959-2014

Cross Correlation of Real GDP with

	x_{t-5}	x_{t-4}	x_{t-3}	x_{t-2}	x_{t-1}	x_t	x_{t+1}	x_{t+2}	x_{t+3}	x_{t+4}	x_{t+5}
real credit to private sector	-0.16	-0.03	0.13	0.28	0.45	0.61	**0.72**	**0.76**	**0.75**	0.69	0.6
real credit to households	-0.02	0.11	0.27	0.4	0.53	0.64	**0.71**	**0.69**	**0.64**	0.55	0.47
real credit to NFC	-0.27	-0.18	-0.05	0.09	0.26	0.42	**0.56**	**0.64**	**0.69**	0.66	0.6
real credit from banks	-0.1	0.04	0.2	0.36	0.53	0.66	**0.75**	**0.76**	**0.71**	0.61	0.48
real M0	0.14	0.11	0.04	-0.05	-0.16	-0.22	-0.23	-0.22	-0.2	-0.16	-0.11
real M1	0.23	0.25	0.27	0.26	0.19	0.11	0.07	0.01	-0.06	-0.11	0.13
real M2	0.38	**0.46**	**0.5**	**0.5**	0.43	0.33	0.21	0.1	0	-0.1	-0.18
real M2-M1	0.31	0.38	0.41	0.41	0.36	0.28	0.17	0.08	0	-0.07	-0.16
real private conso	0.25	0.43	0.59	**0.75**	**0.86**	**0.88**	0.74	0.56	0.35	0.14	-0.03
real private inv	0.16	0.3	0.46	0.64	**0.8**	**0.91**	**0.78**	0.57	0.32	0.1	-0.11
real govt cons	-0.12	-0.13	-0.14	-0.12	-0.09	-0.02	0	0.04	0.09	0.18	0.24
real exports	-0.32	-0.25	-0.13	0.02	0.25	**0.42**	**0.51**	**0.49**	0.46	0.41	0.34
real imports	0.24	0.33	0.45	0.57	**0.72**	**0.79**	**0.72**	0.52	0.3	0.09	-0.12

Cross Correlation of real credit to private sector with

	x_{t-5}	x_{t-4}	x_{t-3}	x_{t-2}	x_{t-1}	x_t	x_{t+1}	x_{t+2}	x_{t+3}	x_{t+4}	x_{t+5}
real M0	-0.21	-0.23	-0.23	-0.23	-0.21	-0.17	-0.12	-0.06	0	0.07	0.12
real M1	0.12	0.17	0.12	0.1	0	0.03	-0.07	-0.11	-0.2	-0.16	-0.23
real M2	0.45	0.48	0.49	0.46	0.39	0.29	0.17	0.06	-0.03	-0.12	-0.19
real M2-M1	0.43	0.41	0.44	0.41	0.39	0.26	0.19	0.09	0.05	-0.06	-0.09
real private conso	0.73	**0.78**	**0.8**	**0.76**	0.67	0.53	0.34	0.15	-0.01	-0.18	-0.31
real private inv	0.62	**0.66**	**0.69**	**0.65**	0.57	0.43	0.26	0.06	-0.11	-0.26	-0.38
real govt cons	-0.21	-0.18	-0.13	-0.08	0.01	0.08	0.15	0.22	0.3	0.34	0.37
real exports	-0.01	0.11	0.18	0.3	0.37	0.44	0.44	0.46	0.41	0.37	0.28
real imports	**0.62**	**0.64**	**0.63**	0.59	0.51	0.38	0.21	0.03	-0.15	-0.29	-0.41

Table 39: HP Correlations $\boldsymbol{GDP}$ Monetary Aggregates Credit, USA, 1959-2014

Cross Correlation of Real GDP with

	x_{t-5}	x_{t-4}	x_{t-3}	x_{t-2}	x_{t-1}	x_t	x_{t+1}	x_{t+2}	x_{t+3}	x_{t+4}	x_{t+5}
real credit to private sector	-0.11	0.03	0.21	0.37	0.56	0.72	**0.84**	**0.83**	**0.77**	0.64	0.49
real credit to households	-0.04	0.11	0.29	0.45	0.6	**0.73**	**0.81**	**0.78**	0.69	0.56	0.43
real credit to NFC	-0.2	-0.08	0.06	0.21	0.42	0.61	**0.75**	**0.79**	**0.78**	0.66	0.49
real credit from banks	-0.06	0.1	0.29	0.46	0.64	**0.78**	**0.85**	**0.81**	0.72	0.56	0.38
real M0	0.37	0.52	0.64	**0.7**	**0.72**	**0.69**	0.58	0.46	0.3	0.16	0.02
real M1	0.22	0.31	**0.47**	**0.56**	**0.55**	0.48	0.43	0.32	0.19	0.04	0
real M2	0.54	0.67	**0.76**	**0.79**	**0.72**	0.58	0.39	0.19	-0.02	-0.21	-0.37
real M2-M1	0.54	**0.66**	**0.71**	**0.71**	0.63	0.5	0.29	0.1	-0.09	-0.25	-0.43
real private conso	0.28	0.46	0.61	**0.76**	**0.86**	**0.87**	0.68	0.47	0.23	0	-0.17
real private inv	0.08	0.22	0.4	0.59	**0.77**	**0.92**	**0.76**	0.54	0.3	0.07	-0.16
real govt cons	-0.09	-0.06	-0.03	0.02	0.07	0.15	0.18	0.19	0.22	0.29	0.32
real exports	-0.46	-0.42	-0.31	-0.16	0.09	0.29	0.45	**0.48**	**0.5**	**0.5**	0.45
real imports	0.22	0.3	0.4	0.53	**0.68**	**0.75**	**0.69**	0.47	0.24	0.04	-0.19

Cross Correlation of real credit to private sector with

	x_{t-5}	x_{t-4}	x_{t-3}	x_{t-2}	x_{t-1}	x_t	x_{t+1}	x_{t+2}	x_{t+3}	x_{t+4}	x_{t+5}
real M0	0.61	0.71	**0.75**	**0.76**	**0.74**	0.67	0.53	0.38	0.22	0.04	-0.14
real M1	0.38	**0.62**	**0.58**	**0.61**	0.47	0.55	0.35	0.27	0.03	0.07	-0.13
real M2	**0.8**	**0.83**	**0.79**	0.7	0.55	0.35	0.13	-0.09	-0.27	-0.42	-0.54
real M2-M1	**0.79**	**0.73**	**0.72**	0.59	0.48	0.21	0.03	-0.18	-0.3	-0.5	-0.56
real private conso	0.67	**0.77**	**0.83**	**0.82**	0.74	0.58	0.37	0.16	-0.03	-0.21	-0.34
real private inv	0.54	0.66	**0.76**	**0.79**	**0.76**	0.61	0.43	0.21	0.02	-0.16	-0.29
real govt cons	-0.15	-0.15	-0.11	-0.07	0	0.05	0.12	0.16	0.23	0.26	0.29
real exports	-0.29	-0.1	0.02	0.25	0.39	0.53	0.55	**0.63**	**0.59**	**0.56**	0.43
real imports	0.56	**0.64**	**0.66**	**0.67**	0.61	0.48	0.29	0.08	-0.13	-0.29	-0.43

Table 40: HP Correlations $\boldsymbol{GDP}$ Monetary Aggregates Credit, USA, 1959-1986

Cross Correlation of real credit from banks with

	x_{t-5}	x_{t-4}	x_{t-3}	x_{t-2}	x_{t-1}	x_t	x_{t+1}	x_{t+2}	x_{t+3}	x_{t+4}	x_{t+5}
real M0	0.59	0.71	**0.79**	**0.81**	**0.8**	0.73	0.58	0.44	0.28	0.11	-0.07
real M1	0.35	**0.58**	**0.57**	**0.61**	0.49	0.55	0.37	0.28	0.07	0.08	-0.1
real M2	**0.8**	**0.86**	**0.85**	0.78	0.64	0.45	0.22	0	-0.2	-0.37	-0.51
real M2-M1	**0.81**	**0.79**	**0.79**	0.69	0.58	0.32	0.13	-0.1	-0.24	-0.45	-0.54
real private conso	0.58	0.71	**0.81**	**0.82**	**0.78**	0.65	0.46	0.25	0.06	-0.12	-0.27
real private inv	0.46	0.6	**0.73**	**0.79**	**0.78**	0.68	0.52	0.3	0.09	-0.11	-0.26
real govt cons	-0.19	-0.19	-0.15	-0.11	-0.04	0.02	0.1	0.16	0.25	0.29	0.33
real exports	-0.35	-0.17	-0.06	0.17	0.32	0.47	0.52	**0.61**	**0.58**	**0.56**	0.45
real imports	0.47	0.58	**0.63**	**0.65**	**0.61**	0.52	0.35	0.15	-0.07	-0.23	-0.37

Cross Correlation of real credit to Households with

	x_{t-5}	x_{t-4}	x_{t-3}	x_{t-2}	x_{t-1}	x_t	x_{t+1}	x_{t+2}	x_{t+3}	x_{t+4}	x_{t+5}
real M0	0.57	0.65	**0.7**	**0.72**	**0.7**	0.64	0.5	0.36	0.2	0.04	-0.14
real M1	0.3	**0.59**	**0.51**	**0.53**	0.45	0.6	0.38	0.26	0.07	0.15	-0.1
real M2	0.69	**0.74**	**0.75**	**0.7**	0.58	0.41	0.21	0	-0.18	-0.35	-0.48
real M2-M1	**0.7**	**0.65**	**0.69**	0.62	0.53	0.26	0.11	-0.08	-0.22	-0.45	-0.51
real private conso	0.59	0.68	**0.77**	**0.78**	**0.74**	0.62	0.43	0.24	0.05	-0.13	-0.27
real private inv	0.48	0.56	**0.65**	**0.7**	**0.71**	0.6	0.47	0.29	0.12	-0.07	-0.21
real govt cons	-0.06	-0.06	-0.03	-0.01	0.04	0.06	0.09	0.11	0.16	0.19	0.23
real exports	-0.27	-0.11	-0.01	0.22	0.35	0.49	0.53	**0.63**	**0.6**	**0.58**	0.45
real imports	0.55	**0.64**	**0.66**	**0.67**	0.61	0.48	0.29	0.08	-0.13	-0.29	-0.43

Cross Correlation of real credit to NFC with

	x_{t-5}	x_{t-4}	x_{t-3}	x_{t-2}	x_{t-1}	x_t	x_{t+1}	x_{t+2}	x_{t+3}	x_{t+4}	x_{t+5}
real M0	0.58	0.67	**0.71**	**0.71**	**0.67**	0.61	0.47	0.34	0.19	0.04	-0.13
real M1	0.43	**0.57**	**0.57**	**0.62**	0.42	0.39	0.26	0.24	-0.02	-0.05	-0.15
real M2	**0.82**	**0.82**	**0.74**	0.59	0.42	0.21	0	-0.19	-0.35	-0.47	-0.55
real M2-M1	**0.79**	**0.74**	**0.65**	0.46	0.34	0.11	-0.09	-0.3	-0.38	-0.5	-0.55
real private conso	0.69	**0.78**	**0.81**	**0.75**	0.63	0.45	0.23	0.02	-0.15	-0.3	-0.39
real private inv	0.56	**0.7**	**0.8**	**0.79**	0.71	0.54	0.31	0.06	-0.12	-0.27	-0.37
real govt cons	-0.24	-0.24	-0.18	-0.11	-0.01	0.07	0.16	0.24	0.31	0.33	0.29
real exports	0.28	-0.08	0.06	0.25	0.37	**0.5**	**0.5**	**0.54**	0.47	0.45	0.33
real imports	0.52	**0.63**	**0.69**	**0.68**	0.58	0.44	0.21	-0.01	-0.22	-0.36	-0.46

Table 41: HP Correlations $\boldsymbol{GDP}$ Monetary Aggregates Credit, USA, 1959-1986

Cross Correlation of Real GDP with

	x_{t-5}	x_{t-4}	x_{t-3}	x_{t-2}	x_{t-1}	x_t	x_{t+1}	x_{t+2}	x_{t+3}	x_{t+4}	x_{t+5}
real credit to private sector	-0.36	-0.23	-0.07	0.1	0.28	0.44	0.56	0.66	**0.73**	**0.77**	**0.75**
real credit to households	-0.09	0.02	0.14	0.25	0.34	0.43	0.45	0.47	**0.48**	**0.5**	**0.48**
real credit to NFC	-0.47	-0.36	-0.21	-0.04	0.14	0.32	0.48	0.61	**0.71**	**0.76**	**0.75**
real credit from banks	-0.24	-0.13	0.02	0.19	0.36	0.52	0.64	**0.7**	**0.71**	**0.67**	0.6
real M0	0.16	0.06	-0.1	-0.29	-0.5	**-0.61**	**-0.6**	**-0.53**	-0.48	-0.36	-0.24
real M1	0.27	0.23	0.14	0.03	-0.15	-0.24	-0.31	-0.36	-0.4	-0.4	-0.41
real M2	-0.14	-0.17	-0.23	-0.29	-0.35	-0.39	-0.33	-0.2	-0.05	0.07	0.19
real M2-M1	-0.22	-0.24	-0.24	-0.24	-0.21	-0.2	-0.11	0.02	0.17	0.26	0.37
private conso	0.12	0.32	0.52	0.7	**0.86**	**0.92**	**0.86**	0.74	0.58	0.39	0.2
private inv	0.29	0.44	0.59	0.74	**0.86**	**0.93**	**0.82**	0.62	0.37	0.15	-0.05
govt cons	-0.3	-0.42	-0.53	**-0.56**	**-0.57**	**-0.53**	-0.54	-0.44	-0.32	-0.16	-0.03
exports	-0.03	0.1	0.26	0.44	**0.62**	**0.75**	**0.72**	0.59	0.43	0.27	0.14
imports	0.23	0.37	0.51	0.67	**0.82**	**0.87**	**0.8**	0.61	0.37	0.15	-0.05

Cross Correlation of real credit to private sector with

	x_{t-5}	x_{t-4}	x_{t-3}	x_{t-2}	x_{t-1}	x_t	x_{t+1}	x_{t+2}	x_{t+3}	x_{t+4}	x_{t+5}
real M0	-0.49	**-0.54**	**-0.55**	**-0.54**	-0.52	-0.44	-0.21	-0.07	0.07	0.19	0.27
real M1	-0.16	-0.24	-0.34	-0.42	-0.51	-0.53	**-0.59**	**-0.59**	**-0.6**	-0.52	-0.47
real M2	-0.33	-0.27	-0.19	-0.1	-0.005	0.08	0.14	0.22	0.29	0.34	0.38
real M2-M1	-0.19	-0.11	0.02	0.13	0.26	0.35	0.44	0.52	**0.59**	**0.6**	**0.62**
private conso	**0.75**	**0.77**	**0.74**	0.66	0.56	0.43	0.25	0.07	-0.1	-0.27	-0.39
private inv	**0.74**	**0.7**	**0.61**	0.5	0.36	0.2	0.02	-0.15	-0.32	-0.46	-0.57
govt cons	**-0.63**	**-0.55**	**-0.47**	-0.33	-0.19	-0.01	0.13	0.28	**0.43**	**0.55**	**0.62**
exports	**0.48**	**0.51**	**0.52**	0.49	0.44	0.41	0.33	0.24	0.13	0.03	-0.07
imports	**0.66**	**0.62**	**0.56**	0.46	0.33	0.2	0.05	-0.1	0.24	-0.36	-0.45

Table 42: HP Correlations $\boldsymbol{GDP}$ Monetary Aggregates Credit, USA, 1984-2014

Cross Correlation of real credit from banks with

	x_{t-5}	x_{t-4}	x_{t-3}	x_{t-2}	x_{t-1}	x_t	x_{t+1}	x_{t+2}	x_{t+3}	x_{t+4}	x_{t+5}
real M0	-0.24	-0.35	-0.42	-0.45	-0.46	-0.41	-0.34	-0.24	-0.1	0.01	0.08
real M1	0.12	0	-0.16	-0.31	-0.45	-0.5	-0.6	**-0.64**	**-0.67**	**-0.61**	-0.61
real M2	-0.27	-0.29	-0.3	-0.28	-0.21	-0.12	-0.03	0.08	0.19	0.29	0.36
real M2-M1	-0.33	-0.28	-0.18	-0.08	0.07	0.19	0.34	0.47	**0.59**	**0.65**	**0.71**
private conso	0.65	**0.7**	**0.7**	**0.66**	0.57	0.46	0.3	0.14	-0.02	-0.19	-0.3
private inv	**0.61**	**0.62**	**0.61**	0.58	0.49	0.34	0.15	-0.04	-0.21	-0.34	-0.43
govt cons	**-0.58**	**-0.55**	**-0.5**	-0.4	-0.3	-0.17	-0.05	0.09	0.25	0.38	0.5
exports	0.26	0.37	0.5	**0.57**	**0.58**	**0.54**	0.45	0.35	0.23	0.11	0.02
imports	0.52	**0.54**	**0.56**	**0.55**	0.47	0.33	0.16	-0.01	-0.17	-0.29	-0.37

Cross Correlation of real credit to Households with

	x_{t-5}	x_{t-4}	x_{t-3}	x_{t-2}	x_{t-1}	x_t	x_{t+1}	x_{t+2}	x_{t+3}	x_{t+4}	x_{t+5}
real M0	-0.39	-0.41	-0.44	**-0.49**	**-0.54**	**-0.51**	-0.47	-0.41	-0.3	-0.18	-0.06
real M1	0.09	0.07	-0.07	-0.2	-0.34	-0.366	-0.48	**-0.54**	**-0.59**	**-0.48**	-0.49
real M2	-0.31	-0.3	-0.25	-0.23	-0.2	-0.2	-0.2	-0.15	-0.08	-0.02	0.02
real M2-M1	-0.33	-0.31	-0.2	-0.1	0	0.02	0.1	0.19	0.28	0.27	0.32
private conso	**0.52**	**0.51**	**0.5**	0.46	0.43	0.38	0.27	0.15	0.06	-0.07	-0.17
private inv	**0.55**	**0.54**	**0.47**	0.43	0.37	0.31	0.22	0.11	-0.02	-0.13	-0.24
govt cons	-0.54	-0.48	-0.48	-0.37	-0.27	-0.16	-0.11	0	0.11	0.17	0.2
exports	0.15	0.19	0.21	0.24	0.28	0.36	0.37	0.36	0.31	0.25	0.18
imports	0.4	0.38	0.34	0.3	0.26	0.24	0.18	0.1	0	-0.1	-0.18

Cross Correlation of real credit to NFC with

	x_{t-5}	x_{t-4}	x_{t-3}	x_{t-2}	x_{t-1}	x_t	x_{t+1}	x_{t+2}	x_{t+3}	x_{t+4}	x_{t+5}
real M0	-0.46	**-0.51**	**-0.51**	**-0.47**	-0.4	-0.3	-0.17	-0.03	0.1	0.23	0.32
real M1	-0.3	-0.39	-0.44	-0.47	**-0.51**	**-0.52**	**-0.52**	-0.48	-0.45	-0.4	-0.34
real M2	-0.27	-0.21	-0.11	0	0.12	0.23	0.33	0.41	0.47	0.5	0.51
real M2-M1	-0.05	0.04	0.14	0.25	0.37	0.48	0.56	0.61	**0.65**	**0.66**	**0.65**
private conso	**0.73**	**0.75**	**0.71**	0.62	0.49	0.34	0.16	-0.03	-0.2	-0.36	-0.47
private inv	**0.68**	**0.64**	**0.54**	0.41	0.24	0.06	-0.13	-0.31	-0.46	-0.58	-0.66
govt cons	-0.54	-0.46	-0.34	-0.22	-0.08	0.09	0.26	0.41	0.55	0.67	0.74
exports	**0.57**	**0.59**	**0.58**	0.52	0.43	0.33	0.21	0.09	-0.03	-0.14	-0.22
imports	**0.66**	**0.63**	**0.55**	0.43	0.28	0.11	-0.07	-0.23	0.36	-0.47	-0.54

Table 43: HP Correlations ***GDP*** Monetary Aggregates Credit, USA, 1986-2014

E Appendix 5 Investment vs. Credit Flow ECM model, USA

E.1 Step 1, ADF tests on individual series, Credit flow and Investment

x = Credit_Flow_NFC$_t$, ADF tests

range	frequency	auto correl (Dx)	ADF test	type	*k*	BJ test	Serial
1952-2014	Quarterly	-0.41	1.55 (-2.58 -1.62)	none	1	0.36	0.06 (0.37)
1952-2014	Annual	-0.39	-5.54 (-4.04 -3.45)	trend	0	0.87	-0.02 (0.88)
1952-Q2 2007	Quarterly	-0.47	1.94 (-2.58 -1.62)	none	1	0.74	0.02 (0.74)

x = Invest_NFC$_t$, ADF tests

range	frequency	auto correl (Δx)	ADF test	type	*k*	BJ test	Serial
1952-2014	Quarterly	0.45	-1.36 (-3.44 -2.87)	drift	1	0.44	-0.05 (0.42)
1952-2014	Annual	0.16	-1.61 (-3.51 -2.89)	drift	1	0.24	0.15 (0.27)
1952-Q2 2007	Quarterly	0.39	-0.95 (-3.46 -2.88)	drift	1	0.55	-0.04 (0.53)

Table 44: ADF tests on $\boldsymbol{Credit\_Flow\_NFC_t}$ and $\boldsymbol{Invest\_NFC_t}$, NFC, USA, 1952-2014

x = Credit_Flow_H$_t$, ADF tests

range	frequency	auto correl (Δx)	ADF test	type	*k*	BJ test	Serial
1952-2014	Quarterly	-0.41	-3.69 (-3.98 -3.42)	trend	1	0.44	-0.05 (0.44)
1952-2014	Annual	0.13	-5.29 (-4.04 -3.45)	trend	1	0.92	-0.01 (0.92)
1952-Q2 2007	Quarterly	-0.41	-4.28 (-3.99 -3.43)	trend	2	0.78	0.02 (0.77)

x = Invest_H$_t$, ADF tests

range	frequency	auto correl (Δx)	ADF test	type	*k*	BJ test	Serial
1952-2014	Quarterly	0.35	-2.88 (-3.98 -3.42)	trend	2	0.74	0.02 (0.74)
1952-2014	Annual	0.31	-3.39 (-4.04 -3.45)	trend	1	0.49	0.09 (0.51)
1952-Q2 2007	Quarterly	0.31	-3.67 (-3.99 -3.43)	trend	1	0.35	-0.06 (0.37)

Table 45: ADF tests on $\boldsymbol{Credit\_Flow\_H_t}$ and $\boldsymbol{Invest\_H_t}$, USA, 1952-2014

$\Delta credit\_Flow\_NFC_t$, ADF tests

range	frequency	ADF test	type	k	BJ test	Serial
1952-2014	**Quarterly**	-1.36 (-3.44 -2.87)	none	1	0.51	-0.04 (0.44)
1952-2014	**Annual**	-1.61 (-3.51 -2.89)	drift	0	0.5	0.04 (0.73)
1952-Q2 2007	**Quarterly**	-0.95 (-3.46 -2.88)	none	0	0.92	-0.03 (0.55)

$\Delta Invest\_NFC_t$, ADF tests

range	frequency	ADF test	type	k	BJ test	Serial
1952-2014	**Quarterly**	-9.72 (-3.44 -2.87)	drift	0	0.51	-0.04 (0.51)
1952-2014	**Annual**	-6.55 (-3.51 - 2.89)	drift	0	0.50	-0.09 (0.51)
1952-Q2 2007	**Quarterly**	-9.83 (-3.46 -2.88)	drift	0	0.92	0.01 (0.923)

Table 46: ADF tests on $\boldsymbol{\Delta Credit\_Flow\_NFC_t}$ and $\boldsymbol{\Delta Invest\_NFC_t}$, NFC, USA, 1952-2014

$\Delta credit\_Flow\_H_t$, ADF tests

range	frequency	ADF test	type	k	BJ test	Serial
1952-2014	**Quarterly**	-2.88 (-3.98 -3.42)	drift	1	0.64	0.02 (0.69)
1952-2014	**Annual**	-3.39 (-4.04 -3.45)	drift	1	0.55	-0.02 (0.86)
1952-Q2 2007	**Quarterly**	-3.67 (-3.99 -3.43)	drift	0	0.56	-0.03 (0.64)

$\Delta Invest\_H_t$, ADF tests

range	frequency	ADF test	type	k	BJ test	Serial
1952-2014	**Quarterly**	-9.72 (-3.44 -2.87)	drift	0	0.51	-0.04 (0.51)
1952-2014	**Annual**	-6.55 (-3.51 - 2.89)	drift	0	0.50	-0.09 (0.51)
1952-Q2 2007	**Quarterly**	-9.83 (-3.46 -2.88)	drift	0	0.92	0.01 (0.923)

Table 47: ADF tests on $\boldsymbol{\Delta Credit\_Flow\_H_t}$ and $\boldsymbol{\Delta Invest\_H_t}$, USA, 1952-2014

E.2 Step 2, DGP of residuals of linear regressions

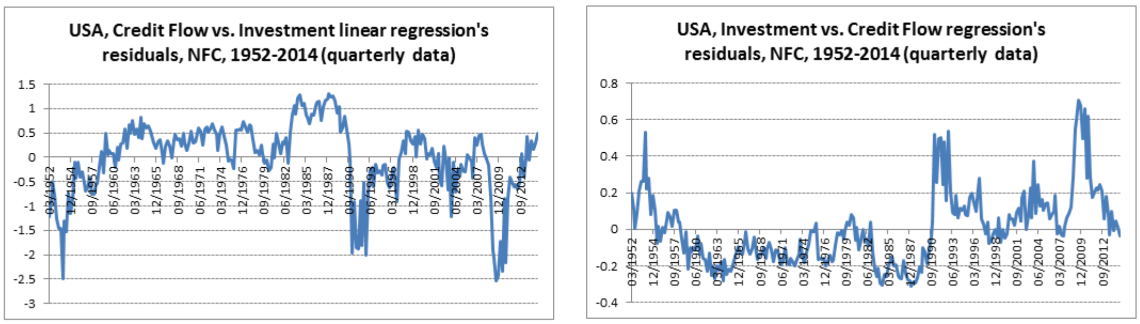


Figure 22: Residuals of linear regressions $\boldsymbol{Credit\_Flow\_NFC_t}$ and $\boldsymbol{Invest\_NFC_t}$ and $\boldsymbol{Invest\_NFC_t}$ vs. $\boldsymbol{Credit\_Flow\_NFC_t}$, Quarterly data, NFC, USA, 1952-2014

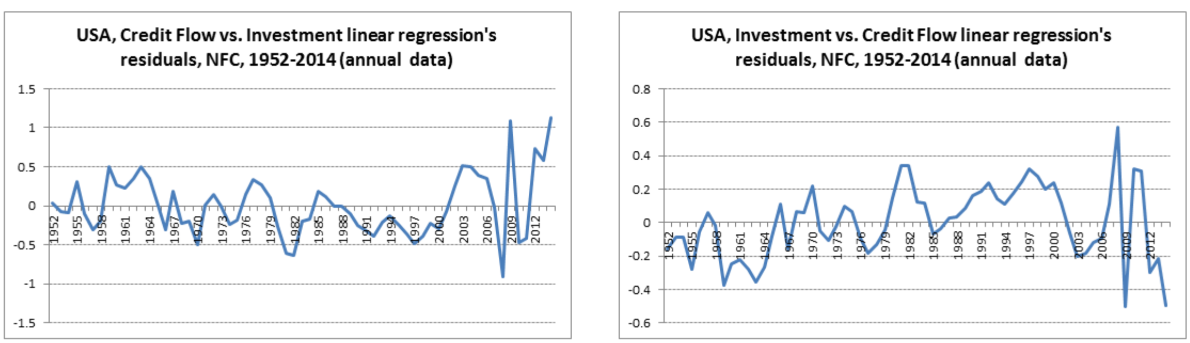


Figure 23: Residuals of linear regressions $\boldsymbol{Credit\_Flow\_NFC_t}$ and $\boldsymbol{Invest\_NFC_t}$ and $\boldsymbol{Invest\_NFC_t}$ vs. $\boldsymbol{Credit\_Flow\_NFC_t}$, Annual data, NFC, USA, 1952-2014

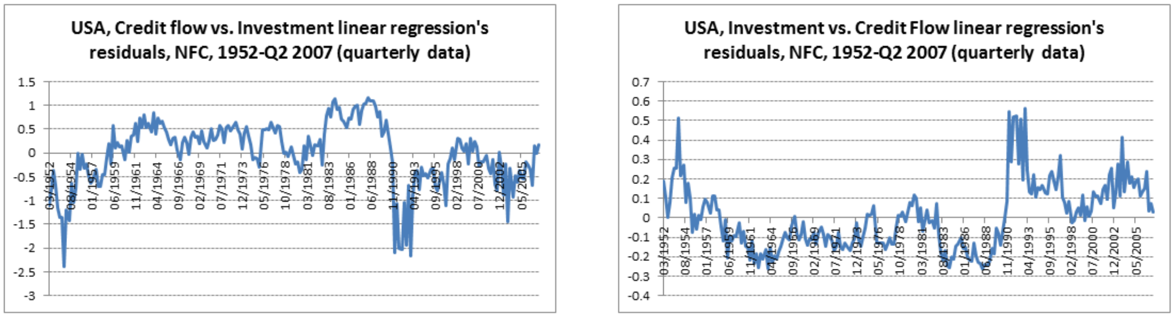


Figure 24: Residuals of linear regressions $\boldsymbol{Credit\_Flow\_NFC_t}$ and $\boldsymbol{Invest\_NFC_t}$ and $\boldsymbol{Invest\_NFC_t}$ vs. $\boldsymbol{Credit\_Flow\_NFC_t}$, Quarterly data, NFC, USA, 1952-Q2_2007

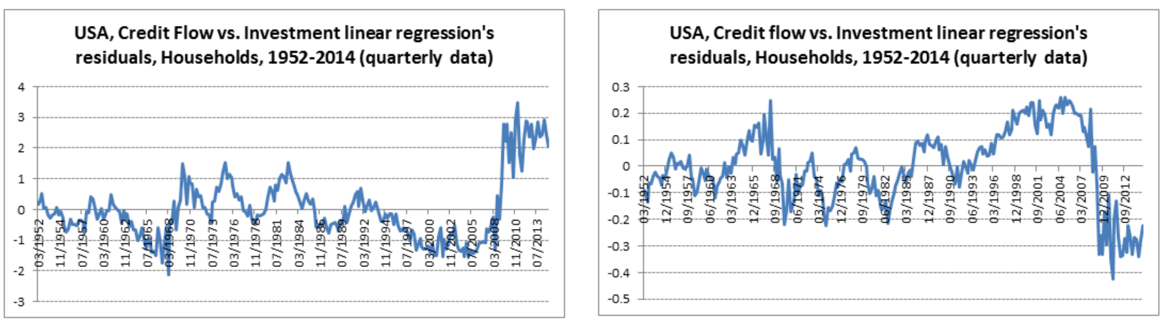


Figure 25: Residuals of linear regressions $\boldsymbol{Credit\_Flow\_H_t}$ and $\boldsymbol{Invest\_H_t}$ and $\boldsymbol{Invest\_H_t}$ vs. $\boldsymbol{Credit\_Flow\_H_t}$, Quarterly data, H, USA, 1952-2014

		ECM, $Credit\_Flow\_NFC_t = f(Invest\_NFC_t)$					
		model tested for ε_t : trend				model tested for ε_t : drift	
range	frequency	t-value trend	5% critical value	t-value drift	5% critical value	t-value drift	5% critical value
1952-2014	Quarterly	-0.76	2.73	0.78	3.02	0.36	2.48
1952-2014	Annual	0.65	2.80	-0.51	3.13	0.11	2.55
1952-Q2 2007	Quarterly	-0.67	2.73	0.73	3.02	0.30	2.48

		ECM $Invest\_NFC_t = f(Credit\_Flow\_NFC_t)$					
		model tested for ε_t' : trend				model tested for ε_t' : drift	
range	frequency	t-value trend	5% critical value	t-value drift	5% critical value	t-value drift	5% critical value
1952-2014	Quarterly	1.51	2.73	-1.42	3.02	-0.16	2.48
1952-2014	Annual	0.99	2.80	-0.88	3.13	-0.02	2.55
1952-Q2 2007	Quarterly	1.46	2.73	-1.44	3.02	-0.12	2.48

Table 48: Testing the type of process for ECM residuals

		ECM, $Credit\_Flow\_H_t = f(Invest\_H_t)$					
		model tested for ε_t : trend				model tested for ε_t : drift	
range	frequency	t-value trend	5% critical value	t-value drift	5% critical value	t-value drift	5% critical value
1952-2014	Quarterly	1.26	2.89	-0.94	3.26	0.34	2.66
1952-2014	Annual	0.49	2.89	-0.27	3.26	0.65	2.66
1952-Q2 2007	Quarterly	0.22	2.89	-0.21	3.26	-0.03	2.66

		ECM $Invest\_H_t = f(Credit\_Flow\_H_t)$					
		model tested for ε_t' : trend				model tested for ε_t' : drift	
range	frequency	t-value trend	5% critical value	t-value drift	5% critical value	t-value drift	5% critical value
1952-2014	Quarterly	-0.70	2.89	0.53	3.26	-0.18	2.66
1952-2014	Annual	0.19	2.89	-0.26	3.26	-0.18	2.66
1952-Q2 2007	Quarterly	0.29	2.89	-0.19	3.26	0.14	2.66

Table 49: Testing the type of process for ECM residuals

E.3 Step 3, ADF tests on linear regressions' residuals ϵ_t and $\epsilon_t^{'}$

Augmented Dickey–Fuller test (ADF) on NFC credit/investments ECM residuals, εt and εt'

		ADF test	ECM, *Credit_Flow_NFC*$_t$ = *f(Invest_NFC*$_t$)			
range	frequency	type	*t* value	1% critical value	5% critical value	*k*
1952-2014	Quarterly	none	-3.00	-2.61	-1.94	1
1952-2014	Annual	trend	-5.15	-2.76	-1.95	0
1952-Q2 2007	Quarterly	none	-2.95	-2.61	-1.94	1

		ADF test	ECM *Invest_NFC*$_t$ = *f(Credit_Flow_NFC*$_t$*)*			
range	frequency	type	*t* value	1% critical value	5% critical value	*k*
1952-2014	Quarterly	none	-2.72	-2.61	-1.94	1
1952-2014	Annual	none	-4.88	-2.76	-1.95	0
1952-Q2 2007	Quarterly	none	-2.70	-2.61	-1.94	1

Table 50: ADF tests on residuals ϵ_t and $\epsilon_t^{'}, \boldsymbol{Credit\_Flow\_NFC_t}$ vs. $\boldsymbol{Invest\_NFC_t}$ linear regressions

		ADF test	ECM, *Credit_Flow_H*$_t$ = *f* (*Invest_H*$_t$)			
range	frequency	type	t value	1% critical value	5% critical value	*k*
1952-2014	Quarterly	none	-2.12	-2.61	-1.94	1
1952-2014	Annual	none	-3.56	-2.76	-1.95	1
1952-Q2 2007	Quarterly	none	-2.84	-2.61	-1.94	1

		ADF test	ECM *Invest_H*$_t$ = *f(Credit_Flow_H*$_t$*)*			
range	frequency	type	*t* value	1% critical value	5% critical value	*k*
1952-2014	Quarterly	none	-2.29	-2.61	-1.94	1
1952-2014	Annual	none	-3.00	-2.76	-1.95	0
1952-Q2 2007	Quarterly	none	-2.84	-2.61	-1.94	1

Table 51: ADF tests on residuals ϵ_t and $\epsilon_t^{'}, \boldsymbol{Credit\_Flow\_H_t}$ vs. $\boldsymbol{Invest\_H_t}$ linear regressions

E.4 Step 4, Fischer tests

model 1 $\Delta credit\_Flow\_NFC_t = \beta + \alpha\Delta Invest\_NFC_t + \lambda\varepsilon_{t-1} + \nu_t$

vs.

model 2 $\Delta credit\_Flow\_NFC_t = \alpha\Delta Invest\_NFC_t + \lambda\varepsilon_{t-1} + \nu_t$

Probability associated to Fischer likelihood ratio test between model 1 and model 2

data used for investment		
range	**frequency**	
1952-2014	**Quarterly**	0.7888
1952-2014	**Annual**	0.9361
1952-Q2 2007	**Quarterly**	0.916

model 1 $Invest\_NFC_t = \beta' + \alpha'\Delta credit\_Flow\_NFC_t + \lambda'\varepsilon'_{t-1} + \nu'_t$

vs.

model 2 $Invest\_NFC_t = \alpha'\Delta credit\_Flow\_NFC_t + \lambda'\varepsilon'_{t-1} + \nu'_t$

Probability associated to Fischer likelihood ratio test between model 1 and model 2

data used for investment		
range	**frequency**	
1952-2014	**Quarterly**	1.013e-08 ***
1952-2014	**Annual**	3.566e-05 ***
1952-Q2 2007	**Quarterly**	2.83e-09 **

Table 52: Fischer tests ECM 1 vs. ECM 2, variables $\boldsymbol{Invest\_NFC_t}$ and $\boldsymbol{Credit\_Flow\_NFC_t}$

model 1 $\Delta credit\_Flow\_H_t = \beta + \alpha \Delta Invest\_H_t + \lambda \varepsilon_{t-1} + \nu_t$

vs.

model 2 $\Delta credit\_Flow\_H_t = \alpha \Delta Invest\_H_t + \lambda \varepsilon_{t-1} + \nu_t$

Probability associated to Fischer likelihood ratio test between model 1 and model 2

data used for investment		
range	frequency	
1952-2014	Quarterly	0.2931
1952-2014	Annual	0.3932
1952-Q2 2007	Quarterly	0.2081

model 1 $Invest\_H_t = \beta' + \alpha' \Delta credit\_Flow\_NFC_t + \lambda' \varepsilon'_{t-1} + \nu'_t$

vs.

model 2 $Invest\_H_t = \alpha' \Delta credit\_Flow\_NFC_t + \lambda' \varepsilon'_{t-1} + \nu'_t$

Probability associated to Fischer likelihood ratio test between model 1 and model 2

data used for investment		
range	frequency	
1952-2014	Quarterly	0.003579 **
1952-2014	Annual	0.04699 *
1952-Q2 2007	Quarterly	0.001422 **

Table 53: Fischer tests ECM 1 vs. ECM 2, variables $\boldsymbol{Invest\_H_t}$ and $\boldsymbol{Credit\_Flow\_H_t}$

E.5 Step 5, Granger Tests

		Causality test:	H0: Δ*Invest_NFC* do not Granger-cause Δ*Credit_Flow_NFC*		Causality tes	H0: Δ*Credit_Flow_NFC* do not Granger-cause Δ*Invest_NFC*	
		Δ*Invest_NFC*$_t$ → Δ*Credit_Flow_NFC*$_t$			Δ*Credit_Flow_NFC*$_t$ → Δ*invest_NFC*$_t$		
		number of lags, *k*	*p*_value, vcov.=NULL	p_value, vcov.=vcovHC(var_*k*)	number of la	*p*_value, vcov.=NULL	*p*_value, vcov.=vcovHC(var_*k*)
1952-2014	Quarterly	2	0.02128	0.02207	2	3.08E-06	0.0008691
1952-2014	Annual	2	0.9402	0.9871	2	0.03768	0.1769
1952-Q2 2007	Quarterly	2	0.167	0.1532	2	0.0002193	0.01016

		Causality test:	H0: Δ*Invest_H* do not Granger-cause Δ*Credit_Flow_H*		Causality tes	H0: Δ*Credit_Flow_H* do not Granger-cause Δ*Invest_H*	
		Δ*Invest_H*$_t$ → Δ*Credit_Flow_H*$_t$			Δ*Credit_Flow_H*$_t$ → Δ*invest_H*$_t$		
		number of lags, *k*	*p*_value, vcov.=NULL	p_value, vcov.=vcovHC(var_*k*)	number of la	*p*_value, vcov.=NULL	*p*_value, vcov.=vcovHC(var_*k*)
1952-2014	Quarterly	2	0.02316	0.02981	2	0.2044	0.2726
1952-2014	Annual	2	2.96E-05	0.00109	2	0.9678	2.96E-05
1952-Q2 2007	Quarterly	3	0.0001564	0.00109	3	0.08307	0.09419

Table 54: Granger tests $\boldsymbol{Invest\_X_t}$ vs. $\boldsymbol{Credit\_Flow\_X_t}$ and $\boldsymbol{Credit\_Flow\_X_t}$ vs. $\boldsymbol{Invest\_X_t}$, $\boldsymbol{X = H}$ or $\boldsymbol{NFC}$

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